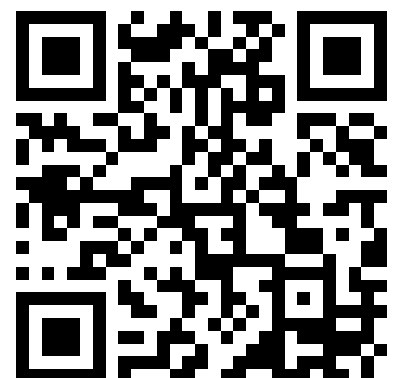
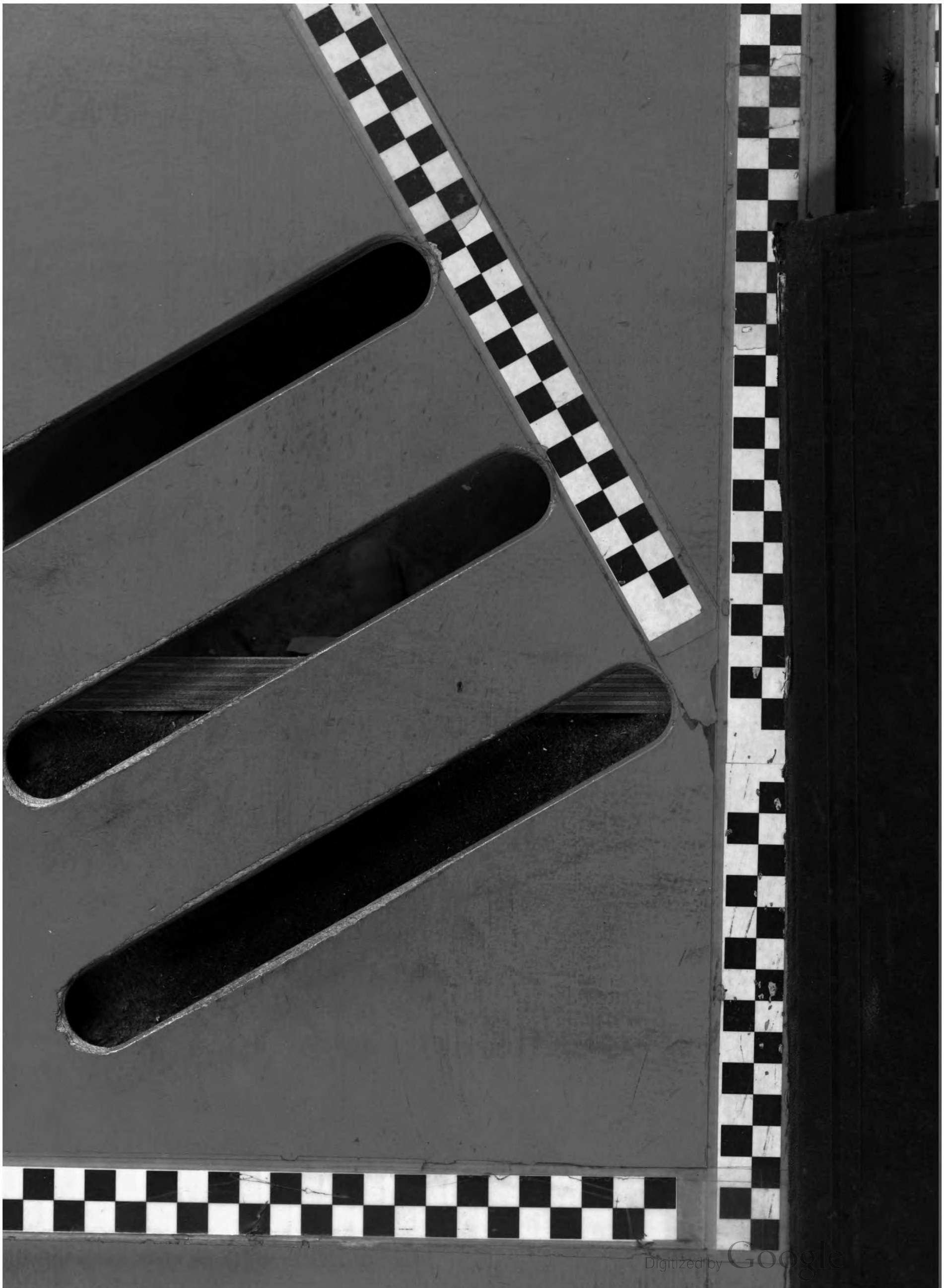

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THE SANITARY ENGINEER & CONSTRUCTION RECORD,

AN ILLUSTRATED WEEKLY JOURNAL, DEVOTED TO

ENGINEERING, ARCHITECTURE, CONSTRUCTION AND SANITATION.

CONDUCTED BY HENRY C. MEYER.

With a view to being of special interest to Engineers, Architects, Builders, Contractors, Water and Gas Works Managers, Building Commissions, Superintendents of Railways and Public Institutions, Plumbers, Steam and Hot-Water Fitters, Municipal Officers, Sanitarians, and persons building or interested in public improvements.

Besides its weekly reviews and comments on matters of current interest to the classes mentioned, the following illustrated serial articles in the different departments may be mentioned as to appear:

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Builders' and Contractors' Engineering and Plant, prepared under direction of Francis Collingwood, M. Inst. C. E. and Mem. Am. Soc. C. E. The scope of these articles is explained in a recent announcement as follows:

"They will describe the leading types of apparatus, appliances, and methods likely to be of interest to every person engaged in engineering operations, the erection of structures, and the transport of materials, and it is proposed to make a special feature of illustrated descriptions of methods and plant employed in important engineering works and on notable buildings, preference being given to work in which novel problems are presented and exceptional measures adopted."

Modern Sewer Construction and Sewage Disposal, by Edward S. Philbrick, Mem. Am. Soc. C. E.

Recent Water-Works Construction (nine articles of this series have appeared).

Recent Sewer Construction (this series will contain illustrated descriptions of recent work).

Pavements and Street Railroads (three articles of this series have appeared).

The New Croton Aqueduct (ten articles of this series have appeared. It is intended to make a complete illustrated history of this important undertaking, including the proposed great dam in the Croton Valley and the entire work involved in the scheme).

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Finally, as heretofore, illustrations and descriptions of notable Hospitals, Theatres, Schools, and Public Buildings will continue to be a prominent feature, and matters of current interest to the profession will be promptly reported and discussed.

DOMESTIC ENGINEERING.—

In this department illustrated descriptions of interesting work in Plumbing, Steam-Heating, Hot-Water Heating, Ventilation, and Lighting will be continued. The serial articles, "English Plumbing Practice," by a Journeyman Plumber, and "Steam-Fitting and Steam-Heating," by Thermus, will be continued. Special efforts will be made to keep up the interest in the current Queries and Replies, by fully illustrating the replies, and likewise to secure descriptions of interesting work in the above-mentioned branches.

SANITATION.—

Municipal and Domestic, will be discussed as hitherto in careful editorials, reviews, etc., alleged discoveries and projects will be promptly noticed, and current news of interest reported as heretofore.

CONTRACTING INTELLIGENCE.—

This department is conducted with a view to giving earlier, more numerous and more reliable items concerning projected Public Engineering and Building work and projected private buildings (of other than local interest) than is done by any periodical published in the United States. The value of these items to Contractors and Manufacturers is enhanced by the regular publication of abstracts of important bids, and the presence in the Advertising Columns of the Proposal Advertisements of the various Departments of the U. S. Government, Municipal Authorities, Water-Works, and Public Building Commissions.

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TESTING BOILERS IN OUR PUBLIC SCHOOLS.

A MOTION lately carried at a meeting of the Commissioners of Education of New York gives authority to the Committee on Warming and Ventilation to advertise for bids to test all the boilers in the public schools of the city.

One of our daily contemporaries says that should the committee report favorably on the matter and attempt to carry into effect what many consider an unnecessary expenditure, there will be much opposition to the scheme; the opposers arguing that as every janitor who has charge of boilers is a licensee under the Sanitary Company of the Police Department, he should be required to test his own boiler.

This is a very narrow view to take of so important a question, and one which affects almost every household in the community. The commissioners, or their committee, should be sustained by public opinion in all that pertains to the safety of the children under their charge, and now that there is a disposition on their part to take one of the necessary precautions in the matter of the 150 or more large steam-boilers in the schools they should be encouraged in the matter to any reasonable extent.

The janitors or men in care of boilers in our public schools do not come under the jurisdiction of the Sanitary Company of the Police Department, nor are they examined by it, nor have they licenses to operate steam-boilers. The wording of the law in this respect is such that school-buildings are technically exempt, both in the matter of boiler inspection by the Police Department and the examination and classification of the men who have charge of them. Nor do we believe that it is possible among the whole force of janitors to get a man who is at all capable of passing intelligent judgment on the safety of a boiler. The commissioners err in judgment, however, if they suppose they can get any security from tests or inspections of boilers made by the lowest bidder. Even if all the bidders were possessed of the desired training and ability there is not one chance in one hundred that the man who would be willing to do it for the least money would do it to the satisfaction of an uninterested individual, and there are many chances that he would see a *job* in it, and condemn or advise the repairs of boilers in really good condition. Indeed, it is very easy to suppose a case where unprincipled persons would pay a bonus to be in a position to condemn some of the many boilers.

But this brings us to the question of *what is a boiler test?* At best, a janitor could only apply the hydrostatic test. This, of course, may be some guide to a boiler's condition, but it is only one of the ways—and not the most important one at that—of finding a boiler's condition, and should never be relied on without ocular demonstration and the hammer test, and a thorough knowledge of boiler construction and setting.

But in the public schools more is required than "testing" the boilers. One-half of them, or even a greater percentage, is out of order in other

respects, and in respects likely to make themselves suddenly and emphatically manifest. The apparatus are designed to be automatic—that is, feed themselves with water and regulate their own fire and draught. In a very large percentage these contrivances are out of order, and we believe it is a small percentage that is in order, and that lumps of coal will be found propped under the air-door, sticks under the damper-lever, the water-feeder shut off and inoperative, as "it leaks," and scarcely any safety-valve to speak of on the boilers—the competitive system of letting work without proper specifications being accountable for the last. A bill now before the Governor may give the police authorities more power in the matter, but even if it should not, the school authorities should no longer delay in settling this question. During the coming summer all the apparatus should be put in perfect order, and the janitors or men that run the boilers should be made to observe the common principles of engineering by some one person in authority. If they came under the police inspection, their licenses could be revoked for drunkenness and dereliction of any kind, but in the absence of such, there might be a chief engineer of schools selected and appointed for his ability, whose duties would be the inspection of the boilers and apparatus, and the supervision of the janitor-engineers. This man, of course, should be selected for his ability and integrity, and he should have, at least, one capable assistant, a suitable hydraulic pump, and a good character.

NOISE AND STREET-PAVEMENTS.

WHAT are the effects, if any, upon the health of those constantly exposed to it, of the continuous noise and roar of the business streets of a great city? We are not now referring to the mere inconvenience which is felt in localities where conversation in an ordinary tone of voice is made difficult by the clangor of machinery or by the rumble of street traffic, but to the effects produced upon an average healthy man by long exposure to such influences as to his ability to work and as to his enjoyment of life.

That noise often has a bad effect upon a sick person is well known; the desirability of quiet to permit of restful sleep to the weary brain is admitted by all. Even in cases of sickness, however, there is a great difference between the effects produced by a comparatively steady, continuous rumble or roar, such as that of a waterfall, or of the sea on the beach, or even of the ordinary passage of vehicles over a stone pavement, and a sudden intermittent interruption of silence such as is produced by the clangor of bells or the passage of a train on the elevated railway. The former, by its monotony, may be actually soothing and lulling in its effects, so much so that a person accustomed to it may at first find it difficult to sleep in a place that is absolutely quiet, while the latter always cause more or less shock to the person enfeebled by disease, though habit may do much to lessen the perception of them.

If continued noise produces any effect on the healthy man it must be chiefly, if not entirely, due to the increased concentration of attention to what is being said which it makes necessary—to increase of strain, in other words. Clerks and accountants employed in noisy localities do not seem to find any special difficulty in writing, in keeping books, etc., so long as they are in good health, but if they come to the office a little below par—say with a slight headache—then they sometimes feel that the noise makes it more difficult to add up a long column of figures or to write an important business letter with clearness and accuracy, that it increases the strain on attention to the matter in hand very much as it does in the case of conversation.

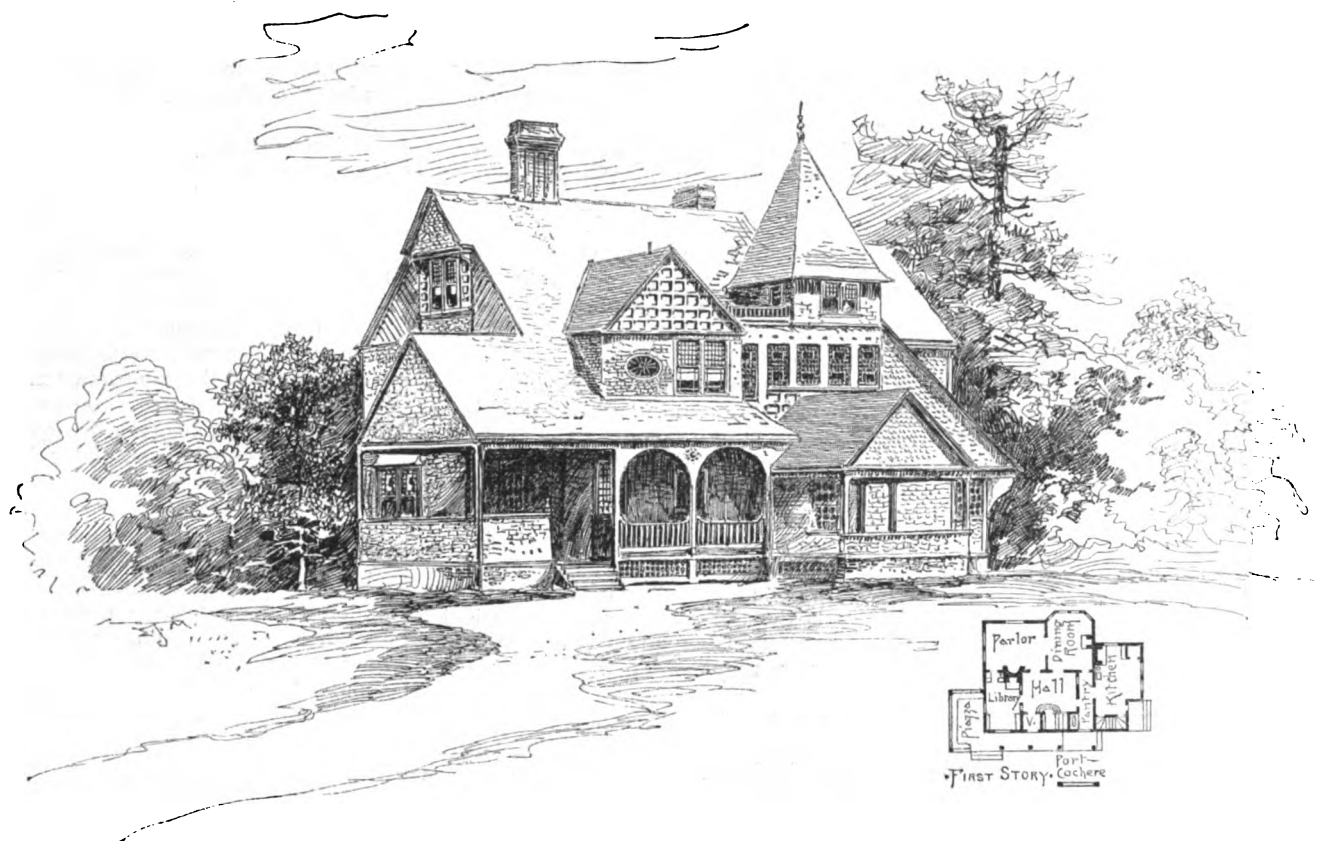
In a previous editorial we have referred to the increasing prevalence of affections of the nervous system among business men, and it is claimed by some that this is in part due to the almost incessant noise to which they are exposed.

not being sufficiently durable under such circumstances to meet the requirements of a reasonable economy; but there are many streets in all cities where the traffic is light, and these considerations do not apply. We are not so badly off as Philadelphia and Baltimore, with their cobblestone pavements, but there is plenty of room for improvement here, and we believe that public opinion will be strongly in favor of the man or men who set to work to bring this improvement about.

A CORRESPONDENT calls attention to a case where a family occupying a house in the south of London were ill, and the plumbing, on examination, proved to be of an abominable character. The soil-pipe was made of tin cans that had once contained American corned beef, the labels of well-known packers being on the cans. The tins were well soldered. Incredible as this statement may seem, this use of empty food-cans had a

carefully tended.' Our account was taken from a description of an eye-witness in an American paper just to hand; it must, therefore, have been correct at the time of his writing. We need hardly add that we deeply regret if our note has given pain to Mr. Caldecott's friends. It is an advantage, however, that the facts should be stated, if only that they may go back to America. Mrs. Caldecott adds: 'It will probably be known shortly that active steps have been taken by some of his friends to find a means of permanently honoring his memory.' We are very glad to hear this, and the pennies of his countless friends among the children should now be turned to this object."

[The American paper referred to was THE SANITARY ENGINEER of April 29, in which appeared a letter from a gentleman of this city, which, as the *Pall Mall Gazette* says, revealed the situation as it was a few weeks before the letter was written (April 20). It seems now that through the publicity given this matter by our publication of the letter in question, Caldecott will have a fitting memorial, toward the expense of which the children of England will contribute.—ED. SAN. ENG.]



A COUNTRY HOUSE AT SCRANTON, PA.—ROSSITER & WRIGHT, ARCHITECTS.

As it is not possible to diminish street traffic, the only remedy for the evil is to provide a street surface which shall be as little resonant as is consistent with durability and safety. All engineers who have written on the subject of street-pavements call attention to noiselessness as one of the conditions which it is desirable to secure, yet it may well be doubted whether in actual practice sufficient attention is paid to this requirement.

Certainly there are many streets in New York City, especially in those quarters occupied by residences of the better class, which have unnecessarily noisy pavements. In this respect Washington is much superior to any city in this country, and the work of its Engineer Department in this direction for the last ten years is worthy of special commendation and of imitation elsewhere.

It is true that these smooth, noiseless pavements are not suited to the requirements of heavy traffic, being slippery in wet weather, and

precedent in a case discovered by Mr. James Muir, a plumber of this city, which was reported in THE SANITARY ENGINEER of April 1, 1881. A section of this soil-pipe made of tomato-cans was given to us and did good service before a committee of our State Legislature at a time the New York Plumbing Law was under consideration, in demonstrating the need of official control over plumbing-work.

CALDECOTT'S GRAVE NOT NEGLECTED.

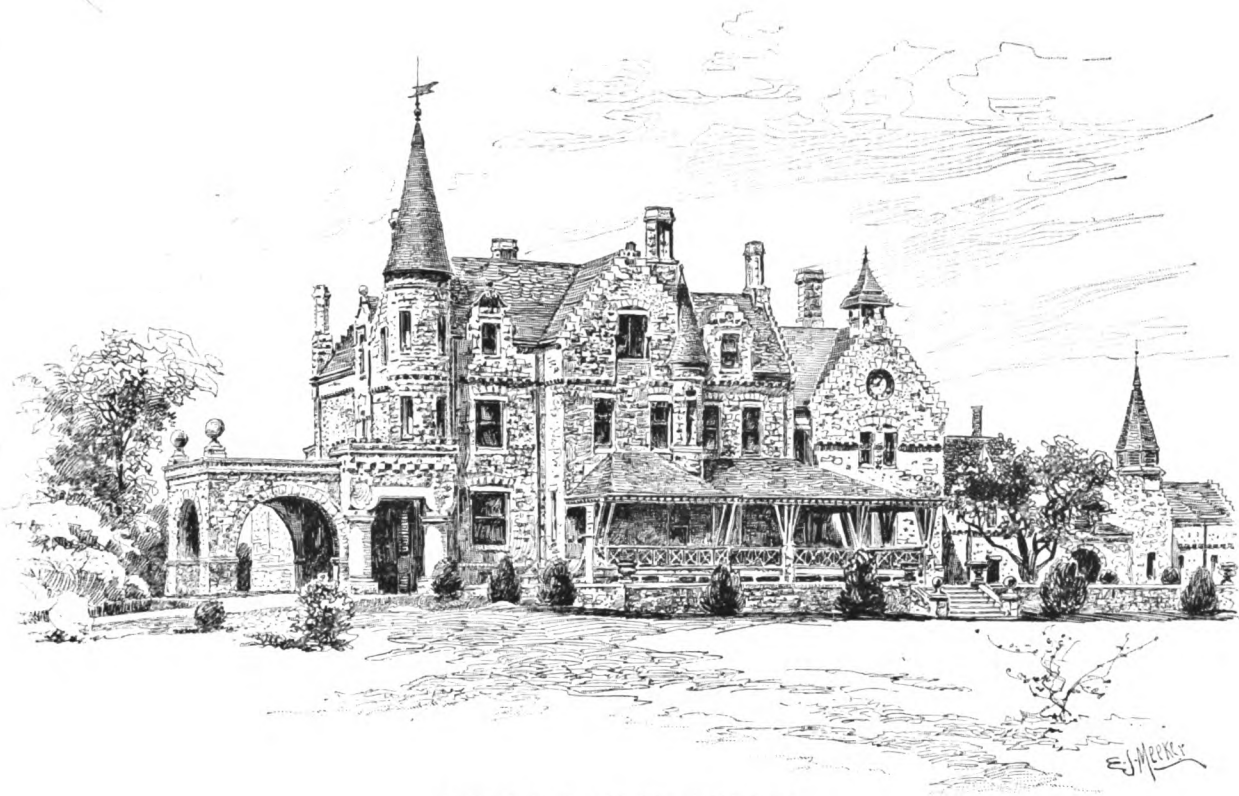
THE *Pall Mall Gazette*, in a recent issue, says: "With reference to our remarks upon the grave of Randolph Caldecott, at St. Augustine, Mrs. Randolph Caldecott writes: 'Before leaving St. Augustine I arranged that a marble headstone with a simple inscription should be erected and a curbing placed round the grave, which would at least keep it apart and distinct. It was not advisable to do more then. My instructions were fully carried out five or six weeks ago, as I know from kind friends living in the town, who have also undertaken to see that the grave is

OUR BRITISH CORRESPONDENCE.

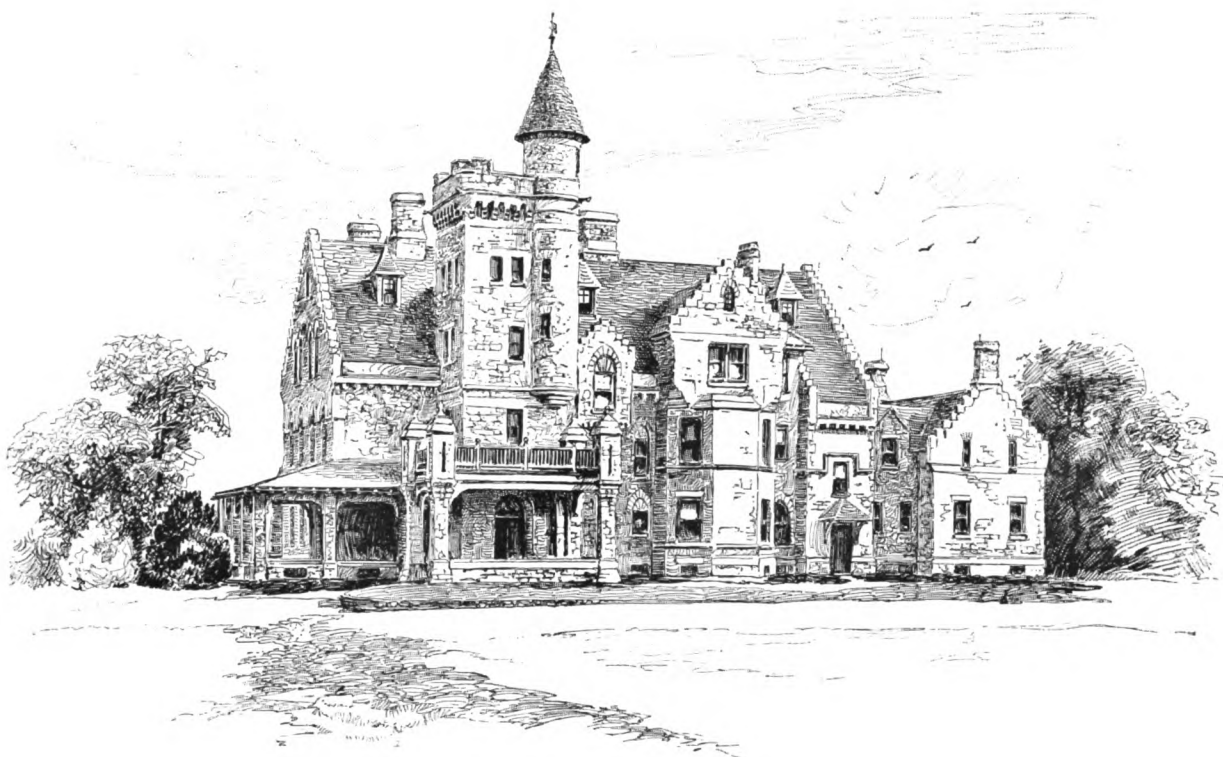
To Provide open spaces in Manchester—American Reports wanted, but Unattainable—The Registration of Plumbers—The Water-Main between Pultah and Calcutta.

LONDON, May 15, 1886.

The Manchester Corporation is bestirring itself with a view to drawing the attention of landlords to their duties with regard to open spaces. The following resolution was passed on the motion of Alderman Harwood, at a recent meeting: "That it be an instruction to the Parliamentary Committee to consider the provisions of the Inclosure Act of 1845, whereby it is provided that allotments for exercise or recreation may be required as a condition of inclosure to the extent of ten acres for a parish of 10,000 inhabitants, eight acres for a parish of 5,000 but under 10,000, five acres if over 2,000 and under 5,000, and two acres for a parish of 2,000 inhabitants, and that such committee be instructed to report as to how far that principle is applicable in the existing state of the law to ecclesiastical property, or property in the hands of private owners, and as to the measures



G. W. & W. D. HEWITT, ARCHITECTS.



ADDISON HUTTON, ARCHITECT.

THE SANITARY ENGINEER ILLUSTRATED SERIES.

COUNTRY SEATS NEAR PHILADELPHIA.

which it is desirable to take for the purpose of amending the law upon this subject."

The first editorial in the issue of THE SANITARY ENGINEER of April 22, 1886, comments on the fact that American public reports are not procurable at any authorized depot for their sale. I would like to place on record the fact, which may be interesting to your authorities, that the extraordinary system of distribution in the States is a matter of comment over here. I very frequently hear of inquiries being made for such reports, which cannot be satisfied, or, if satisfied, only at considerable trouble and expense. It certainly seems absurd that records made by experts, after inquiry, conducted under the most favorable conditions for elucidating facts, should not be available to those most interested in such matters. In contrast with the custom which you accurately state as obtaining over here, American practice certainly suffers, and I hope your suggestion will bear fruit.

There will doubtless be some "black sheep" to whom the new Guild of Plumbers, or rather the Plumbers' Company, and the council appointed to assist in the formation of the guild will accord the right to use "R. P." after their names. The fact is almost unavoidable. In the early stage of this, as with all other societies, a number of members will be admitted without passing any examination, the qualification being the fact of having practiced a certain time as a master plumber. The work of formation is proceeding on this basis, the lists of applicants for admission being passed in the absence of any objection being raised to individuals.

In connection with the opening of a new 48-inch water-main between Pultah and Calcutta, an announcement was made by Mr. Kimber, the Engineer to the Corporation, of a very novel character. Mr. Kimber informed his hearers that in the course of the work a saving had been effected amounting to about 33 per cent. of the estimate. The original estimate was for 26 lakhs of rupees, but the actual cost was now reckoned at Rs. 1,750,000, or a difference of Rs. 850,000—say \$331,500. Municipal authorities are generally able to show a considerable outlay in excess of that estimated for works, but very seldom indeed do they come within the amount. This 48-inch main is about 13 miles long, and is part of a series of works for increasing the supply of water for Calcutta and its suburbs. Some 5,720 pipes were required for this work, the pipes weighing about three tons, four cwt. each. They were supplied under contract by Cochrane, Grove & Co., of Middlesboro, England, and so low are freight and iron at present that the price, landed on the Jetties at Calcutta, was only £6 (\$28.80) per ton. In connection with the extension works at Pultah, the object of which is to double the supply for Calcutta, there will be three engines, each capable of lifting 5,500,000 gallons in ten hours, two settling-tank, and eighteen filters, together with the land, building, jetties, etc., for same, are estimated to cost Rs. 1,443,119, or, together with the cost of the main referred to above, total of Rs. 3,193,119 (say \$1,245,316.32). Fawcett, Preston & Co., of Liverpool, are under contract for supplying the engines. There appears to have been considerable discussion upon the respective merits of masonry conduits and iron pipe for the conveyance of the water. The Committee of Government Engineers, to whom the matter was referred by the corporation, decided in favor of the former, but doubt was raised as to the purity of the water delivered thereby, as compared with that through iron piping, and after reference to authorities in England iron was decided on.

SAFETY-VALVE.

OUR ILLUSTRATION OF A MODERATE-COST HOUSE.

A COUNTRY HOUSE AT SCRANTON, PA.—ROSSITER & WRIGHT, ARCHITECTS.

WE illustrate this week the residence of G. du B. Dimmick, Esq., at Scranton, Pa.

The lower part of the house is clapboarded and painted; the upper part is covered with stained shingles. The rooms of the first story are all finished in hard wood. The cost of the house was about \$7,000.

Messrs. Rossiter & Wright, of New York, are the architects.

UNDERGROUND RAILWAYS IN CITIES.

No. III.

(Continued from Vol. XIII., page 610.)

SPECIAL WORKS (CONTINUED).

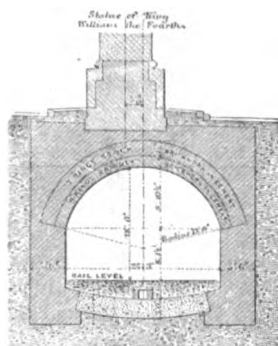
SOME of the most interesting work was done on the last link in the inner circle completed in 1884.

One of the special works is shown in Fig. 18, where the railway passed directly under the statue of William the Fourth, and where the tunnel-arch passed partly through the foundation of the statue. The statue weighed 176 net tons. It was first underpinned at two opposite points; next the two side walls of the tunnel were put in for about thirty feet, then a cutting was made through under the centre of the statue, and a 4-foot length of the arch built. In building up the underpinnings, that portion of each which would form by its position a portion of the finished arch was laid up in brick-work in radial courses just as it would be in the arch, so that it only remained to complete these portions over to the side walls to have two more short lengths of arch finished. Then other lengths were cut through and additional arch lengths built, until the whole was completed, and *entirely without settlement*. The total thickness of the arch was 4½ feet.

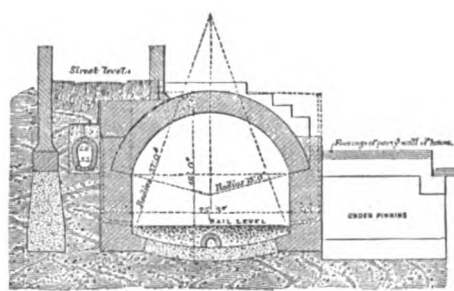
Figure 19 shows a very difficult piece of work in passing through and under some heavy warehouses. The street or lane (Cloak Lane) was but fifteen feet wide, and the footings of the walls were 27 feet below street-level. The first step was to underpin the wall of the building on

the opposite side to the full depth, as shown by the dotted portion of the section. The party-walls were also underpinned up to the exterior tunnel lines, and the remaining front supported temporarily on brick-work. The portions of the side walls of the tunnel which passed through the party-walls were then built as underpinning, and the side walls afterward made continuous by building in the short lengths between the party-walls. Next the portions of the arch coming between the party-walls were built and backed up, after which each party-wall in turn was needled and the needles supported on the finished portions of the arch. This allowed of the removal of the remainder of the party-walls by sections and the completion of the tunnel. It will be seen that to add to the difficulty a sewer 4x2½ feet had to be rebuilt through the lane.

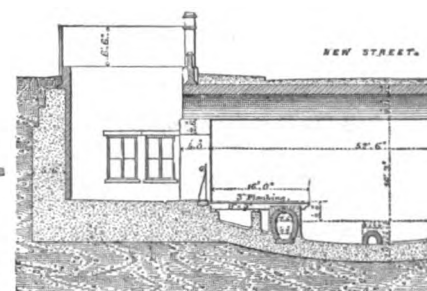
Figure 20 shows some of the difficulties encountered at the Cannon Street station, where at this section there was but one foot of depth available between the finished work of the covered way and the road, and to gain the necessary head-room the girders at the centre were given a depth of but two feet. It will be seen that they are built as cantilevers, supported on posts, and held down by the side walls into which they are anchored, the anchors being shown by dotted lines. A middle and a high-level sewer (the latter not shown) had also to be provided for, and several gas and water mains diverted. Another portion of the station was under the court of the station of the South-eastern Railway (Fig. 21), where the cabs and other vehicles stood. The booking-offices were underneath this and



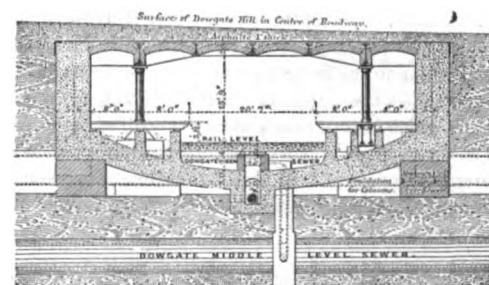
UNDER STATUE OF WILLIAM THE FOURTH.
FIG. 18.



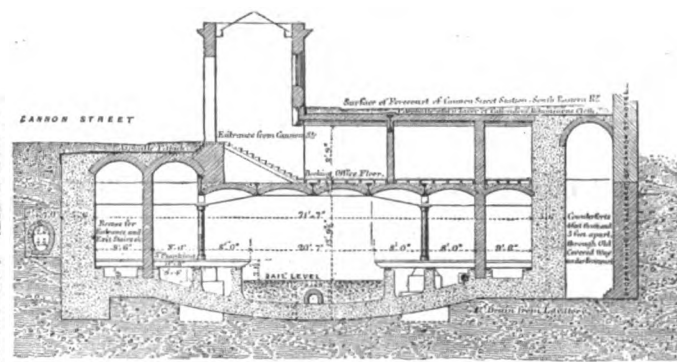
UNDER WAREHOUSES AT GREAT ST. THOMAS APPS.
FIG. 19.



MARK LANE STATION.
FIG. 22.



CANNON STREET STATION.
FIG. 20.



CANNON STREET STATION.
FIG. 21.

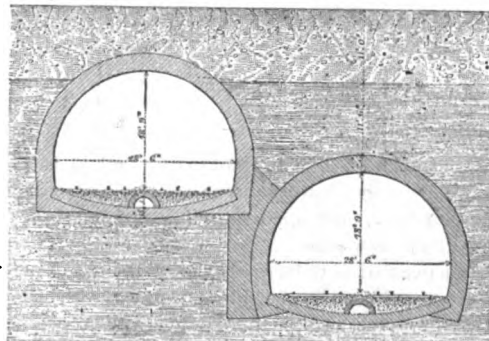
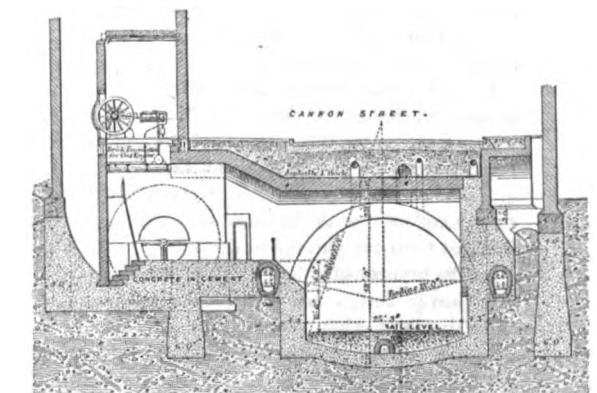


FIG. 23.



VENTILATING FAN, CANNON STREET.

FIG. 24.

below all the railway. The high-level sewer is seen at the left hand of the section.

Figure 22 is a half-section of Mark Lane station, showing the 4x2½-foot sewer placed under the platform. Here, also, there was but one foot between the finished work of the covered way and the street surface, and the girders have a clear span of fifty-two feet.

Figure 23 is an interesting case in the earlier work, where a new tunnel had to be built at the lower level, underpinning one of the side walls of the old tunnel, while trains were thundering through it every three minutes. This was done "without the slightest crack or injury to the old work."

Figure 24 shows the Cannon Street ventilating-fan. Two new sewers were built here. The gas and water pipes are shown as supported on brick piers resting on the

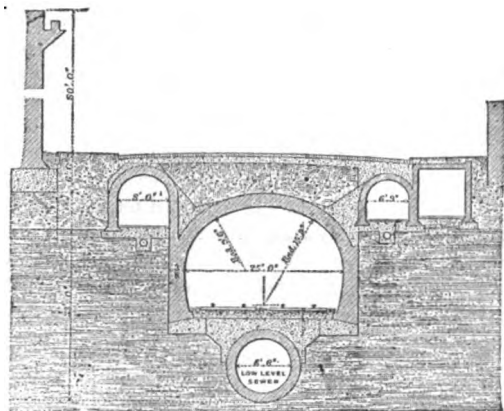


FIG. 25.

arch of the tunnel, and it will be seen that the store-vaults on the right-hand side of the street have been underpinned and preserved. The fan proved to be troublesome on account of the vibrations caused by it in windows and doors in the neighborhood.

Figure 25 is a section of the earlier work, where the subways on each side have been preserved.

One wide distinction between the first work done and the later is well shown by comparison of this with Fig. 19. the walls of buildings being underpinned in the latter and not in the former. Another difference was the avoidance in later work of a thorough cut, each side wall being put down in a narrow trench, and the interior, or "dumpling," being taken out after the arch was turned.

(TO BE CONTINUED.)

STEAM-FITTING AND STEAM-HEATING BY "THERMUS."

NO. LII.

(Continued from Vol. XIII., page 468.)

COMBINED STEAM AND HOT-WATER APPARATUS.

AT the end of the last article we considered the three principal positions, one of which the expansion-tank is likely to occupy on a hot-water apparatus, and pointed out the principal advantages and disadvantages due to each position. What we have now to consider under this heading is the construction of steam-apparatus that will work, at least fairly well, as a hot-water apparatus when certain additions are made to them incidental only to the latter.

It must be remembered, though, by any one who may be tempted to change an apparatus, either from steam to hot-water or *vice versa*, that we here only treat of principles, and that the question of materials *used*, how put together, size of pipes, etc., and questions of strength to withstand pressure or collapse, or the behavior of boilers or heaters when changed from one purpose to the other, is not considered.

Let us first consider how a low-pressure steam-apparatus of approved design may be transformed into a hot-water apparatus, and what changes and additions, if any, are necessary in the system or in matters of detail connected with the system.

Figure 1 shows a section through, we will say, a private house apparatus. It is drawn purposely a little *mixed* in its details, somewhat like a "job" would be that had been added to and extended from time to time, but, withal, adhering to a pure system. It is a gravity or *closed* system, in which the flow of the steam and the water of

condensation is always in the same direction, except in vertical steam-flow-pipes or in very short connections where no special object is to be obtained in a steam-apparatus.

We have then to consider the apparatus in detail with the view to altering and changing it sufficient to make a fairly good hot-water apparatus of it, assuming all the time that there is no question as to the size of the flow and return pipes for their new duties—a question that will be considered by itself hereafter.

The question of the expansion of the water must always be considered, but as a tank attached to any part of the apparatus by a pipe so long as the tank itself forms the highest part of the apparatus will do, provided it is of sufficient capacity to hold the increase of bulk of water after

source, it should not be allowed, unless the taker pays for it by meter. Frequently a tank a very little bigger than a water-pail is used and the waste goes on continuously.

In the diagram of a steam-apparatus that we have drawn the steam-pipe where it rises from the boiler forms an "air-trap." By an air-trap in a hot-water apparatus is meant *any high place or pocket in the pipes or apparatus from which the air cannot pass with the water*. It therefore becomes necessary in altering this apparatus to at once provide a means of getting rid of air when filling an apparatus, or that might form there, from the water in the boiler. We will now assume that it is best to attach our expansion-tank to the return-pipe of the apparatus as shown by the dotted lines. If we do so it then becomes abso-

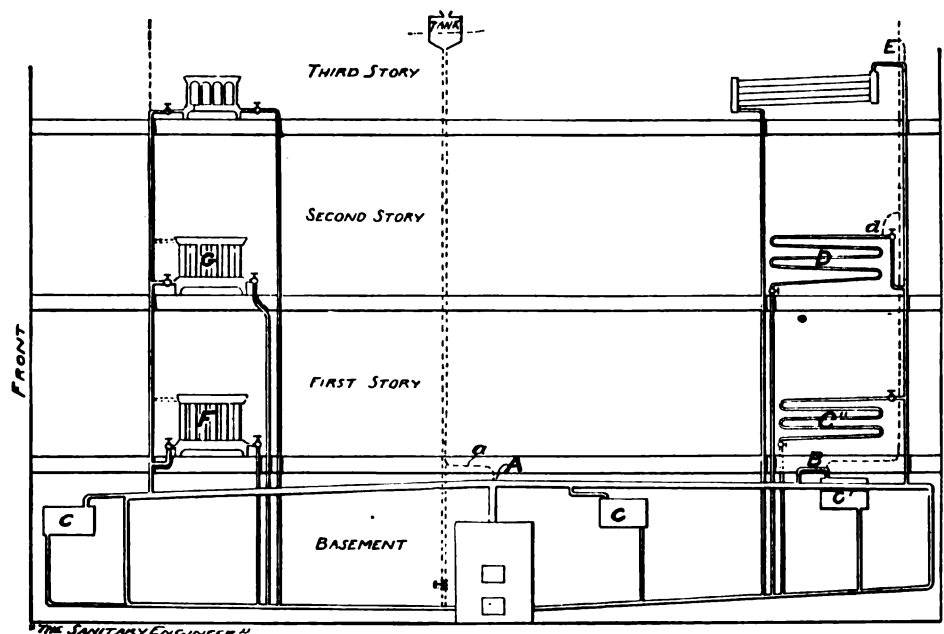


FIG. 1

being warmed, we may not consider it further than to consider the method of knowing what size to use, or, to put it in a *very* practical way, "to know that the tank is big enough."

I believe a common rule among hot-water engineers is to provide a tank of not less than one-twentieth the capacity of all the pipes and heaters. This, of course is an approximate rate and should be founded on two things to be exact: (1) the expansion of the water when warmed from 40° Fah. to 212°, and (2) the expansion or increase of size of the envelope. As a matter of fact, if water is warmed from *mean* density to the boiling point under our atmosphere, it increases just the .0433 of its bulk (Tredgold) for that change, which is very nearly one-twenty-third of the whole, and as the common rule (one-twentieth) allows a somewhat greater percentage of tank than is absolutely necessary for this change, not considering the increase of bulk of the

lutely necessary that we put a vent at A in the main flow-pipe. This vent may be a simple cock, provided we watch and attend to it, and that it is only air we are likely to be troubled with. We must be there to attend to it when we first attempt to fill the apparatus with water or we cannot succeed; the air being imprisoned by the water rising through the return-pipes into the ends of the main as well as flowing from the boiler through the upright main. This brings us to a choice of vents—what we will use in the way of a cock, automatic or otherwise, or a substitute or an equivalent for one. If we use an ordinary pet-cock, we have to attend to

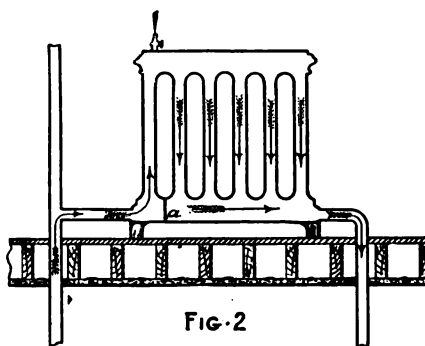


FIG. 2

apparatus, which will be in favor of the tank, it is pretty safe to rely on the "one-twentieth rule." This one-twentieth, of course, only applies to the capacity of the tank below its overflow-pipe.

A practice that is to be condemned is the one of putting in a very small tank on a hot-water apparatus with ball-cock and overflow-pipe, and letting the water waste every time the apparatus warms up. In country buildings, where water has to be pumped perhaps by hand to a reservoir-tank in the top of the house, this would be very trying, to say the least, on the one that has to do the pumping, as with every change of temperature some runs either in or out of the apparatus; but in cities, where the water comes from a common

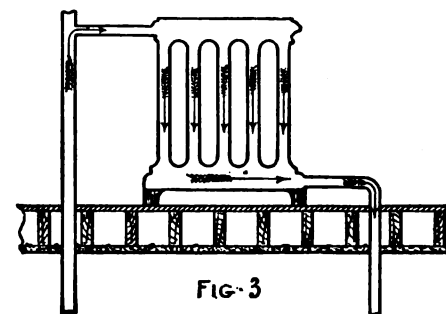


FIG. 3

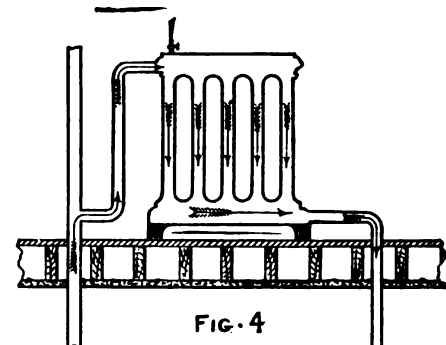


FIG. 4

it too often. If we use an automatic cock it will disappoint us in its operation; and there is apparently nothing for us to do but carry a small pipe from this point to a point of elevation above the level of the tank. This pipe or any vent of like principle in an interchangeable apparatus must have a valve very close to the main, that it may be closed

when the apparatus is used for steam alone, or that it may be "choked" down to the smallest practicable opening for hot water. Of course, when the pipe rising to the tank is close to the point to be vented, it is not necessary to run a second pipe clear to the top of the house. A small pipe *a* can be joined with it about as shown. This small pipe in a measure vitiates the good to be secured by connecting the tank with the return-pipe, as it allows a hot circulation into the tank-pipe; but by closing the valve in the pipe *a* until the smallest possible aperture remains that will let off air, the object is secured, and any little hot water that can pass will be soon cooled by the mass in the tank-pipe. This vents the point A in a practical manner.

If we follow the main to the right we come to the coil C. This, as it is fed from the bottom or under side of the main, requires no vent, as there is no air-trap. If we pass to coil C' we have a little different problem, as here there is an air-trap, and while it will work as a steam-apparatus all right, it will probably become air-bound as a hot-water one at this place (B). This may be fixed again with an air-cock and attended to when it requires it, or a small pipe may be run as in the first case, or if there has to be a pipe carried above the level of the tank from any of the coils on the rising line at this end of the house, this vent may be carried to it. The coil C' does not require a vent, or at least it will not if the line it takes its supply from is vented at the top. The reason the coil C does not require a vent is because there can be no "air-trap," the pipe having a gradual rise backward to the rising line, and although the flow of the water will be in the opposite direction the air-bubbles, if formed, will find their way back and into the rising line, finding vent in the manner provided for the latter, be that what it may.

The coil D, though, is an exception, although it is of the same class of coils as C, and it must have a separate vent. This is because its connection with the rising line is near the floor below the top pipe of the coil. This whole coil then is an air-trap, and so great a one that it could not be filled with water without a vent. It then will require a vent at its highest point. This vent may run above the tank, with a valve close to the pipe, as before explained for the position A, and the vent from the position B may be carried with it. We then come to the position E. This coil, if it occupied the position C, would not have to be vented, nor in fact has it to be vented now; it is the air-trap formed by the head of the riser that requires venting, and this may be taken into the pipe which passes from below as shown. The dotted lines, therefore, show how this line would have to be vented to make it operate. When we are at the top of the house then with the vent-pipes, they may be run to the tank and drop into it or connect with its side. These pipes must not be too small in diameter or the air-bubble will not pass up through the water freely. A $\frac{1}{2}$ -inch iron pipe is the smallest that should be used, though a $\frac{1}{4}$ -inch nipple and valve is large enough close to the point to be vented.

We now go to the main to the left of the boiler. This in itself, or the coil C at its end, requires no vent, as the air will go out at *a*. If we follow the rising line to the radiators the result is different. If the radiators should be vertical tubes or loops, closed on the upper end, they must be removed and some radiator used that will work with hot water. If the same connections are used all the radiators must be vented, as each makes an "air-trap." If the connections enter above as shown by the dotted lines, Fig. 1, at F and G, then air-vents may be omitted, as the vent on the head of the line will do for all. If the old connections are used and a radiator substituted that has one upward flow-pipe at the inlet (as Fig. 2), and all the rest of the loops down pipes, it also must be vented separately.

The arrangement of hot-water radiator shown in Fig. 2 is to allow the conventional inlet-connection. When a heater is near the riser it makes little difference whether the connection is the same as that shown in Fig. 3 or not, but in long connections Fig. 2 makes far the neatest connection. However, Fig. 3 shows a radiator and connection that requires no vent—at least in the room—whereas with Fig. 2 there must be a vent. Figure 4 shows the same heater as Fig. 3, but connected as it would have to be if the connection was of any considerable length or had to pass a window on its way from the riser. It then becomes practically the same as Fig. 2, and must be vented.

(TO BE CONTINUED.)

ENGLISH PLUMBING PRACTICE.

BY A JOURNEYMAN PLUMBER.

No. LV.

(Continued from Vol. XIII., page 444.)

URINALS (CONTINUED).

IN some hotels and clubs urinals are fitted up similar to Fig. 3 in my last paper, but instead of the iron gratings on the floor perforations are made in the slate foot-stone, and an earthenware receiver, with flushing-rim and water-supply attached, is placed to catch drippings.

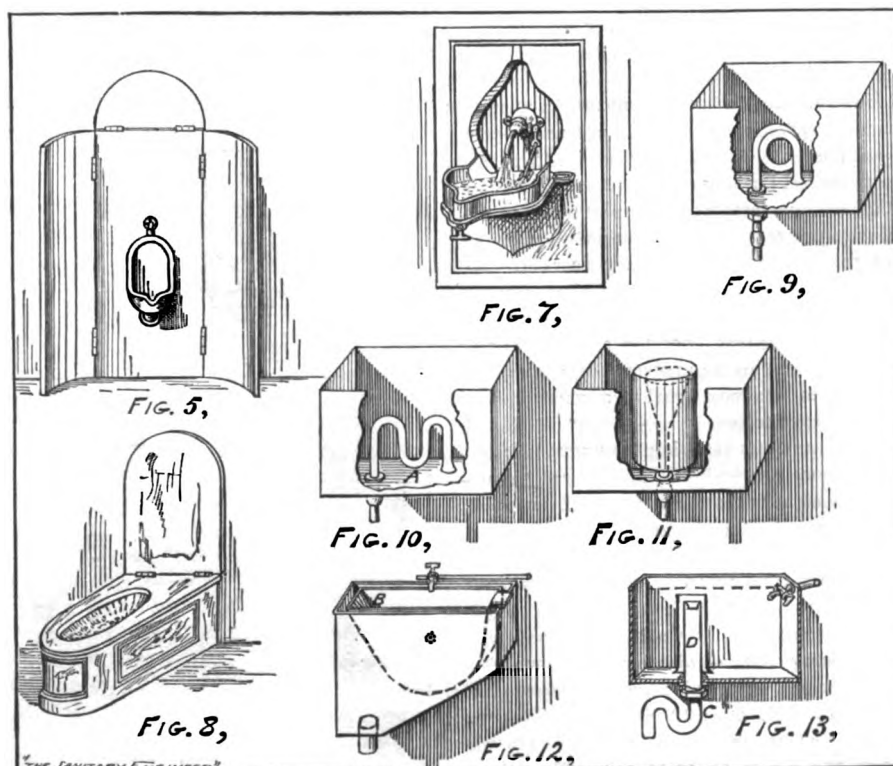
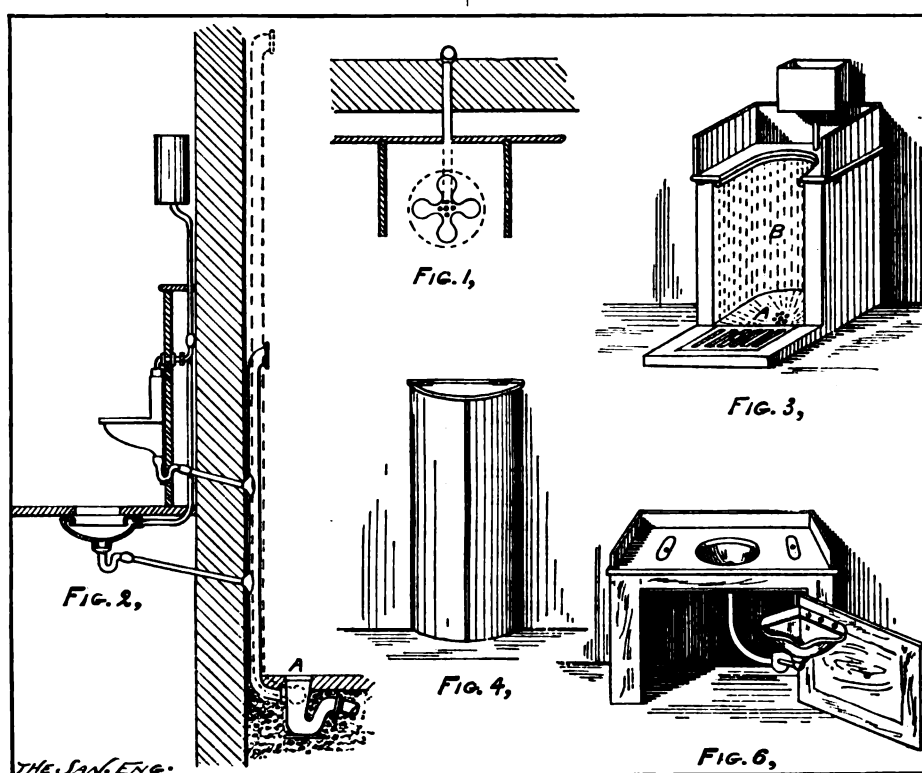
Figure 1 is a plan of one basin showing this. This drip-pan has a waste-pipe connected, and is flushed at the same time as the urinal-basin. One large London club has, by the advice of their sanitary engineer, removed the fixed urinals and substituted small portable utensils. A slop-sink as shown at Fig. 6, THE SANITARY ENGINEER, issue August 27, 1885, is fixed for emptying the bowls into, and a hot-water tap fixed over the sink for rinsing purposes. An attendant is told off for the special duty of keeping these places clean. The man's wages is a bar to a general adoption of this system, but where this is not objected to the cause of smells is removed. In another London club a range of six urinals fitted up, the plan of each stall being

as Fig. 1, was a cause of complaints, by reason of the smells being driven out at the bottom end of the waste-pipe each time the automatic flushing-cistern was discharged.

Figure 2 is a sectional elevation. The stench was so bad that the grating at A had to be removed, a solid cover bedded over the gully-trap, and a vent-pipe fixed to a considerable height to carry away the unpleasant odors. The new vent-pipe is shown by dotted lines.

Figure 3 is a sketch, drawn from memory, of a urinal that was shown at the International Health Exhibition held in London in 1884. A was a white porcelain bowl, rounded to fit the back of the stall, and the front part extended beneath the iron grid on which users would stand. The back B was made of one piece of thick glass bent as shown in the sketch, the whole being inclosed with white veined marble. The flushing was done by means of an automatic flushing-tank arranged to empty itself at regular intervals of time through a sparge-pipe bent to fit the back. The grid C was easily removable for cleaning the bottom basin. Although this urinal was shown by itself there is no reason why it should not be fitted up in a range.

There are sanitary engineers who prefer to have a narrow step fixed to urinals, for the reason that users must then stand close and so avoid spreading urine over a larger sur-



face than necessary. An opposite argument may be used, that people in a hurry would stumble at the step, especially when fixed in a dark situation.

One large firm of sanitary engineers in London fit up a urinal with a mahogany inclosure so arranged that upon lifting up the top of the inclosure the sides open at the same time by means of the necessary brass couplings, and by an ingenious piece of mechanism a valve is opened so that water streams over the whole of the inner surface of the basin during the time the place is being used. On closing the lid the sides shut up and the water is turned off at the same time.

Figure 4 shows the fitting closed up, and Fig. 5 when it is open. It is spoken of as being suitable for offices and billiard-rooms.

There are two or three makers of sanitary fittings who fit up a wash-hand basin and urinal in the same inclosure. Figure 6 is an illustration of one. The urinal-basin is fitted to the door, on opening which water begins to flow. The waste-pipe is connected to that of the wash-hand basin by means of a hinged and telescopic joint.

There are also one or two folding-urinals in the market. These are hinged on the back edge on to a cast-iron frame fixed over a recess made in the wall. The basin is pulled down for use, after which it is closed by lifting up the front edge, when the contents are tilted into a kind of hopper and so run away down a waste-pipe.

Figure 7 is a sketch showing one that is spoken of as being compact and suitable for offices, ships, and other places where space is limited. A round basin and slab, in one piece, fitted up in a similar way as Fig. 7, makes a compact wash-hand basin. In this case the rod which connects the basin to the key of the supply-cock should be omitted, and bibb-faucets, having jointed nozzles for pushing back out of the way, used so that hot and cold water can be turned on at pleasure. A great many of the fittings that have been described are very ingenious and compact, but they all have the disadvantage that unless they are well looked after and get the necessary attention they soon become offensive smelling. For this reason urinals should always be situated in a well-lighted place, and, if possible, away from the dwelling. When, of necessity, they must be fixed inside the house, the room in which they are situated should be thoroughly well ventilated, and an attendant instructed to thoroughly cleanse the basin and as much of the waste-pipe, etc., as can be got at as often as possible—even once a day would not be too often. One has only to look at a neglected *po de chambre* to be convinced of the importance of cleanliness in regard to any kind of urinal fitting.

In some public museums and exhibitions urinettes are fitted up in ladies' cloak-rooms. Figure 8 is a sketch of one. These are mostly arranged with a valve beneath, so that when the seat is depressed a stream of water flushes the basin. There is no doubt that all urinals, whether stalls or basins, should have a constant stream of water running over the parts exposed to the action of urine, but in some places the supply of water is limited, either by scarcity or by the rules of the water companies, to a discharge through a water-waste preventing valve or cistern of about one-half to one gallon to each basin; but it frequently happens that even this limited quantity of water is not used—people come and go and never think of flushing the place after them. To insure a periodical flushing of the places under discussion automatic flushing-cisterns are in great favor, as when once started they require no further attention beyond making good any of the working parts that may wear out. Most of the water companies in London permit the use of these cisterns, but some of their inspectors put seals on the regulating-cocks after testing that a not too extravagant quantity of water is used. This is to prevent them being set to go off so often as to be almost equal to a constant stream of water being allowed to run.

Figure 9 is a sketch of a very simple automatic flushing-cistern holding about two gallons. If required to empty itself about every eight or ten minutes a small tap can be fixed and regulated to fill the cistern in that time; but if it is intended to discharge about every ten or twenty minutes, it is sometimes necessary to fix a reversible ball-valve. The action is as follows: The bottom parts of the pipe-coil inside the cistern retain a small quantity of water, the upper parts being charged with air. This makes the coiled pipe similar to a service-pipe fixed as shown at Fig. 4, page 547, Vol. IX. of THE SANITARY ENGINEER, when it is what is commonly called air-bound. The water has to rise in the cistern so as to cover the coil a few inches so that the weight of the water is sufficient to over-

come the resistance offered by the pent-up air inside the bent pipe. A small supply-cock set so that the water dribbles very slowly into cistern, will not fill it quick enough, so that the water will dribble away down the pipe as fast as it comes in. By adding a reversible ball-valve and regulating it so that when the cistern is partly full the floating ball will open the valve and let the water run in at full bore, it will head up so quickly that any small quantity dribbling away has no effect on the ultimate results. The writer has tried several experiments with models of his own make.

Figure 10 is a sketch of one which acts precisely as Fig. 9, but a great deal depends upon the depth of the bag part A.

Figure 11 is a patent automatic cistern used for the same purpose.

Another kind is shown by sketch Fig. 12. In this case the inner chamber is hung on bearings fixed slightly out of the centre, but so shaped that when quite full of water the part B becomes the heaviest so that it falls down and allows the contents to escape into the outer chamber and down the pipes. When empty, the other end being the heaviest, it falls back to its original position. India rubber buffers have to be fixed for the tumbling-chamber to knock against, otherwise it is very noisy in its action.

Figure 13 is another description of automatic flushing-tank. In this case a syphon has to be fixed as shown at C, so as to retain the air in the syphon-pipe D, so that the water will head up to the dotted line, when it will have sufficient weight to drive out the air and start the syphon. These cisterns are made to a large size and used for flushing drains, etc.

(TO BE CONTINUED.)

Novelties.

Under this heading we propose to describe and illustrate appliances of probable interest to our several classes of readers. The selection will be made without reference to the wishes of agents or patentees, being governed solely by considerations of novelty, ingenuity, and probable interest to readers, and especially the fact that they have not been elsewhere described. As a rule we shall make no comments, and it is to be distinctly understood that a notice does not imply approval. No charge will be made for these notices, and any offer of pay for their insertion will insure their omission. We shall be glad to have our attention called to novelties suitable for this section.

TRUSS FOR SUSPENDING ELECTRIC-LIGHTS.

THE accompanying sketch and Figs. 1 and 2 show a light truss-supported track and lamp-carriage for the suspension of an electric-light over the middle of the street, designed by C. W. Wallis & Co., of Worcester, Mass.

Its object is to provide means to put the light over the centre of the street, particularly in streets of cities where there is much foliage.

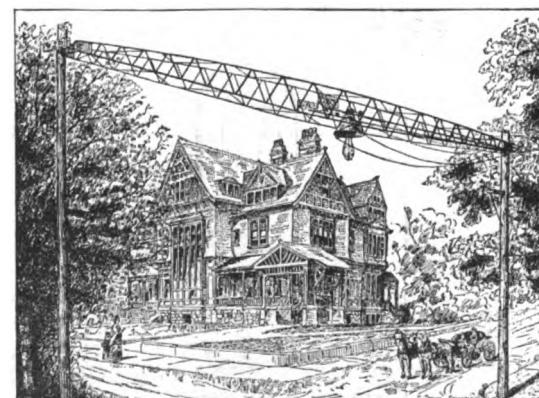
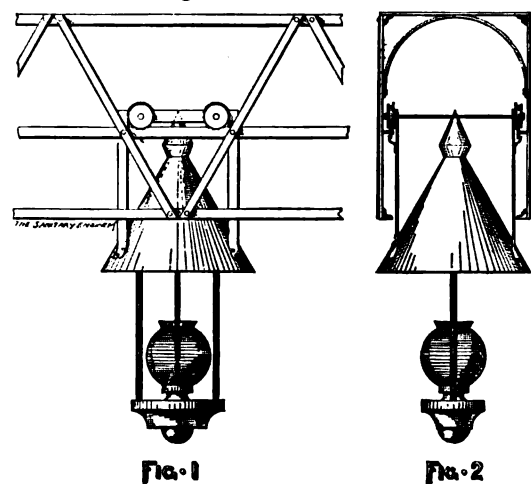


FIG. 3.

The truss is made of $\frac{3}{4}$ " x $\frac{3}{4}$ " x $\frac{1}{8}$ " angle iron riveted, with cross-braces at the top and similar braces for one-half the length of the bottom, but the half where the carriage runs is supported and stiffened by arch braces over the top so as to have an unobstructed bottom. The carriage is operated by cords and pulleys so that the carriage is drawn to one end when it is necessary to put in new carbons. Spikes in the post and a seat are arranged for the lineman.

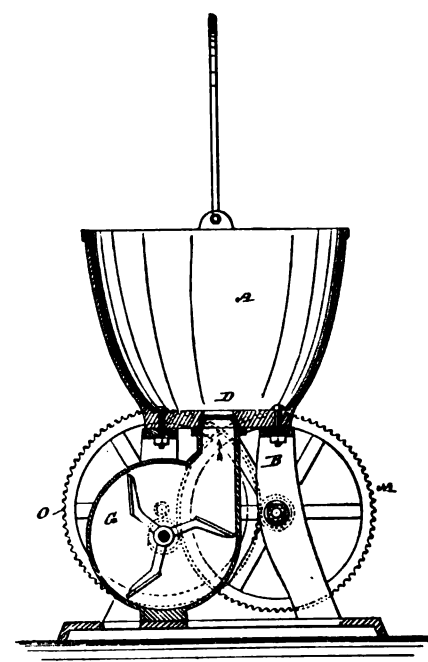
Figure 1 is a side view of the carriage and lamp, and Fig. 2 shows the detail of the track and rollers, with a cross-section of the truss at the end where the bottom is open.

PLUMBERS' FURNACE.

THE accompanying sketch shows a novel form of plumber's furnace lately patented by Mr. John Clegg, of Providence, R. I.

The object of the apparatus is to provide an improved plumber's furnace for melting lead and solder, which will be of simple construction and provided with means for producing a strong draught within itself.

It consists of a cast-iron furnace-pot A, attached to a frame B, with a tuyere-opening D in the centre of its bottom. Below the pot and in the frame is a small hand-



blower G with gear-wheels O and M, and with pinion wheels (not shown) with which to rotate the fan at a high speed.

The apparatus is portable, and its use is obvious to any one who has seen a plumber's apprentice spend the first quarter of each day swinging the furnace out-of-doors.

STREAM GAUGINGS FOR THE WATER-SUPPLY OF PHILADELPHIA.

At a meeting of the Engineers' Club of Philadelphia, on April 17, Mr. H. W. Sanborn gave an account of the gaugings of that city.

The streams gauged were the Perkiomen Creek and tributaries in Montgomery County, the Neshaminy and tributaries, and the Tohickon, in Bucks County. The original intention was to gauge the minimum flow only, and for that purpose weirs were constructed on eight different streams. They were very substantially built, as they had to withstand the run of ice in the spring of the year. Heavy bed-logs were placed at the level of the bed of the stream, and the superstructure built on that. They were made watertight either by sheeting placed below the bed-log, to rock bottom, or a cement-mortar wall. The crests of the weirs were generally about two feet above the beds of the streams, and were made of 2-inch oak plank. Gauge-boards were placed about five feet above and below the weirs, and connected, by levels, with the same. The one above indicated the depth of water on the crest. The one below was used only in case the weir was submerged by high water. The weirs varied in length from fifteen to seventy feet, according to the width of the stream. The formula used for calculating the flow over the weir was the one by Fteley and Stearns, of the American Society of Civil Engineers. Stream-gauge stations were established near

the weirs. Readings were taken there at the same time that they were at the weirs. When a sufficient number of readings, at various heights, were made, a "curve of flow" was plotted by a comparison of the two. Then, when the crests of the weirs were removed for the winter, the flow was found by referring the stream-gauge readings to the "curve of flow."

The great fluctuation in the flow of the streams, caused by the great number of mills on them, necessitated a great many observations at the weirs to get a correct gauging. This difficulty was overcome by the use of automatic gauges. They were run by clock-work, and drew a line on a roll of paper, corresponding to the rise and fall of the stream. Two description of gauges were used. One was designed chiefly by Mr. Stierle, of the U. S. Engineers' Office, Philadelphia. The minimum flows were found to be so small that the larger flows had to be determined. These had to be found by other methods, for the weirs would only carry, at the most, two feet in depth, while the water in the streams sometimes raised as high as sixteen feet. The measurements of the large flows were made mostly by the use of electric-current meters. The measurements had to be made from bridges, and where none existed in proper places, small suspension bridges were put up. One was built over the Perkiomen, at Frederick, of 120 feet span, and one over the Neshaminy, at Rush Valley, of 133 feet span. By means of the meter, the velocity of the water was taken at a great number of places in a line across the stream, and a close estimate of the velocity of the whole cross-section determined. Stream-gauges were placed near the meter-stations, to be read when measurements were made, answering the same purpose as those connected with the weirs.

In some cases, large flows were measured by getting the velocity of the stream by means of pole floats. When used, care was taken to have the length of them as near the depth of the water as possible, and they were run at as many stations across the stream as was necessitated by the changes in the even flow of the stream. The rise and fall of the water during freshets was so sudden, and the stations, eleven in number, were so scattered—the watersheds covering five hundred square miles—that it was impossible to get to and make measurements of more than one or two streams during a freshet. Then, many times, the freshets would come in the night and nothing could be done but the taking of continuous readings of the stream-gauges.

To overcome these difficulties with our small force and get at least fair measurements of all the streams at the high point of a freshet, "maximum stream-gauges" were set up on most of the streams. A place was chosen where the bed of the stream was uniform in width and slope and two similar gauges set up. They were usually from two hundred to five hundred feet apart. They were made in the form of a box, from eight to twelve feet long and six inches square inside. One side opened as a door. They were placed on end and shielded and supported by heavy timbers imbedded in the soil or bolted to the rock bottom. Vertically through the centre of the box ran a brass rod, which was graduated. A metallic float ran on the rod in such a manner that it would rise with the water, but would remain fixed on the rod at the highest point the water reached after it had fallen. The two gauges were connected by levels, and from the gauge readings the slope of the water was determined. From this the velocity of the stream was found by the Kutter formula. The daily flows of all the streams have been tabulated, from the commencement of the gauging in July, 1883, to January 1, 1886, and the field is still being continued. The daily flows have also been shown graphically on sheets, with the rainfall on the water-shed and the temperature annexed. The connection between the three is well shown. Rain-gauge stations were established over all the water-sheds, and the data obtained from them, combined with that from previously existing gauges, which was kindly furnished us by the observers, have also been plotted graphically, showing plainly the variations of the rainfall over large areas. Three automatic rain-gauges were used to show the intensity of the storms.

A NEW explosive, under the figurative name of "panclastic," or "universal smasher," has lately been receiving attention in France. The explosive, which consists of an admixture of nitric peroxide with benzene in the proportion of 18.6 to 81.4, is stated to be of unequalled force.

MEETING OF THE AMERICAN SOCIETY OF MECHANICAL ENGINEERS.

THE American Society of Mechanical Engineers held its spring meeting at Chicago last week, its headquarters being at the Grand Pacific Hotel, and its sessions in the building known as the Methodist Block. President Coleman Sellers was obliged to be absent by reason of illness, and Vice-President Henry R. Towne presided. About 150 members were in attendance. The opening session on Tuesday evening was devoted to an address of welcome and reply and discussions on various topical questions which had been proposed. The one, "What is the present status in Chicago of the question of smoke-preventing furnaces under steam-boilers?" drew out considerable discussion, with the asserted result that no mechanical device yet tried in Chicago prevented smoke, except at increased cost of fuel—the judgment being that an intelligent fireman or stoker was the best smoke-preventer.

The question, "How do you make successful foundations for structures upon yielding earth?" was replied to by Mr. W. L. B. Jenney, architect, of Chicago, who was present by invitation and explained in an interesting manner, with the aid of a blackboard, the methods employed by him in the erection of the Home Insurance Building, an illustrated account of which was published in the issue of THE SANITARY ENGINEER for December 10, 1885. At the close of the session the members were invited to an informal supper.

On Wednesday meetings were held morning and afternoon, and devoted to the reading and discussion of papers, and in the evening an elegant banquet was enjoyed, tendered by the local committee, at which a large number of ladies were present.

The following papers were read and discussed during the day: "Experiments on Transmission of Power by Belting," by Mr. Wilfred Lewis, of Messrs. William Sellers & Co., of Philadelphia; "Relative Efficiency of Centrifugal and Reciprocating Pumps," by Mr. William O. Weber, of Lawrence, Mass.; "Production of True Crank-Shafts and Bearings," by Mr. Horace See, of Philadelphia; and "Substitutes for Steam," by Mr. George H. Babcock, of New York; on "Another New Steam-Indicator," by Mr. Charles W. Barnaby, of Salem, O.; by Capt. Henry Metcalfe, U. S. A., now stationed at the Watervliet Arsenal, Troy, N. Y., on "The Shop Order System of Accounts"; on "The Engineer as an Economist," by Vice-President Henry R. Towne, of Stamford, Conn.; and on the "Inventory Valuation of Machinery Plant," by Mr. Oberlin Smith, of Bridgeton, N. J. Papers were also read on "Irregularity in the Contraction of Duplicate Iron Castings," by Thomas D. West, of Cleveland, O.; by Frederick G. Coggin, of Lake Linden, Mich., on "A Novel Chimney Staging"; on "The Purification of Water for Domestic and Manufacturing Purposes," by Mr. Thomas S. Crane, of Newark, N. J.; by F. W. Taylor, of Nicetown, Philadelphia, Pa., on "The Relative Value of Water-Gas and Gas upon the Siemens Producer for Melting in the Open-Hearth Furnace"; and, finally, one on "Handling Grain in California," by Mr. John H. Cooper, of Philadelphia, describing machinery which cuts a swath of grain twenty-five feet in width, thrashes it, winnows it, pours it into bags, sews up the bags, and piles them up in the field. Abstracts of those papers of interest to our readers will be published in subsequent issues.

The paper of Mr. George H. Babcock on "Substitutes for Steam," and the three papers on "Shop Economics," by Messrs. Henry R. Towne, Capt. Henry Metcalfe, and Mr. Oberlin Smith, excited the most discussion; the last three were read together and discussed as a whole, with the result that a vote was adopted that papers on shop management were desired at the meetings.

Thursday was spent in visiting the Stock Yards and witnessing the various operations of killing hogs and cattle and preparing them for the market, including the packing of the meat in tin cans. The works visited were those of Messrs. Armour. The town of Pullman was next visited and a couple of hours were spent there. The party then were taken to the Rail Mills of the North Chicago Iron-Works, where the admirable plant was examined with great interest and much complimented by the experts present. Each process was witnessed, from the melting of the iron to the completion of the Bessemer steel rails. The society during the day were the guests of the Chicago, Burlington and Quincy Road, who furnished a special train on which was a lunch-car in which meals were served

the entire day. In the evening topical discussions were resumed.

Friday morning C. M. Gidding's paper on "Dynamometer for Measuring Power Required to Move Slide-Valves," which was a record of some experiments made by the author, excited considerable discussion, and to which the author intelligently replied, receiving the applause of the convention for his interesting contribution. Prof. Woodward's, of St. Louis, paper on "Manual Instruction" was an account of the methods of instruction adopted at the Washington University of St. Louis. Prof. Thurston, of Cornell, contributed in writing a discussion on the paper, the main point of which was a condemnation of the attempt to change the title of "Mechanical Engineer" by granting a degree of Dynamic Engineer. The question of whether a man was best fitted to conduct a large enterprise by having been educated in a school or shop excited the usual discussion such subjects always secure. Mr. Kent made an emphatic protest against the dropping of the title of mechanical engineer and substituting that of dynamic engineer, on the ground that it would be misunderstood, "too hifalutin," and was unnecessary. The subsequent vote of the convention emphatically disapproved of any movement contemplating a change in the title of "Mechanical Engineer."

Prof. W. P. Trowbridge's paper, on "The Relative Economy of Ventilation by Heated Chimneys and Ventilation by Fans," was read, followed by some written comments by Mr. George H. Babcock. Mr. George H. Babcock offered a resolution endorsing the rules under which the business of the convention had been conducted. Mr. Oberlin Smith desired to amend the rules by giving five minutes more time for the reading of abstracts. This led to some debate, but the proposition was negatived. It is well to say here that the business of the convention was most admirably conducted under the rules in question, and we commend them to sister societies who now waste a great deal of time in listening to rambling, impromptu discussions and the reading of entire papers when a brief abstract would answer every purpose for those who are capable of discussing intelligently the subject under consideration, since they would doubtless take the trouble to read the full paper in type before attending the meeting.

The substance of the rules adopted is as follows:

- (1.) All papers to be in the secretary's hands at least nine weeks before the date of meeting, in order to permit of their being printed and distributed in advance.
- (2.) The circular announcing the date and programme of a meeting will inclose a blank on which members who expect to attend can notify the secretary of their intention, and each member so notifying will then receive an advance copy of the papers to be presented at the meeting.
- (3.) With the papers so sent in advance will be inclosed a blank on which each member can notify the secretary of the papers he proposes to discuss, and priority in debate will be given to members in the order in which such notices are received by the secretary.
- (4.) Advance copies of papers may be requested by members unable to attend a meeting who propose to forward written discussion thereon, such discussion to be forwarded so as to reach the secretary not later than two days before the date of meeting.
- (5.) The docket for each meeting will be so prepared as to allot to each paper and its discussion such proportion of the available time as is deemed proper and just. At the expiration of the time so allotted to any paper, debate on it shall cease and the next paper will be taken up. Should any time remain at the close of the docket, discussion of the papers previously presented may be resumed in the order in which they stand on the docket.
- (6.) The reading or presentation of a paper, either by title or by abstract, may be done by the secretary or by its author, but must not occupy more than five minutes.
- (7.) Discussion which has been reduced to writing in advance may occupy not exceeding ten minutes for its presentation, either in full or by abstract, by the secretary or by its author; each member participating in extemporaneous discussion shall be limited to not exceeding five minutes at one time, and having once spoken shall not again claim the floor until all others who desire it have had such opportunity.
- (8.) Priority to the floor shall be accorded first to authors of written discussion and afterwards to other members in the order in which their notifications, either written or verbal, are received by the secretary.
- (9.) The author of a paper shall be entitled to five minutes in which to close the debate on it, or may waive this right and submit his closing comments in writing, provided that they are forwarded to the secretary within four weeks from the close of the meeting.
- (10.) The operation of these rules may be suspended at any time by resolution of the council or by a vote of the society.

Resolutions of thanks were then offered to the Local Committee, each member being mentioned by name, to Mr. Stone, Manager of the Chicago, Burlington and Quincy Railroad, and to the citizens of Chicago for their generous hospitality. The convention then adjourned, some of the members leaving for their homes and others taking a carriage ride to the various points of interest about the city.

Those of the papers believed to be of interest to our readers will be given in subsequent issues of THE SANITARY ENGINEER.

Gas and Electricity.

Illuminating Power of Gas in New York City.

Week ending	New York Gas-Light Company.	Manhattan Gas-Light Company.	Metropolitan Gas-Light Company.	Mutual Gas-Light Company.	Municipal Gas-Light Company.	Kickerbocker Gas-Light Company.	Equitable Gas-Light Company.
May 29 ...	26.42	10.53	22.64	30.66	29.25	24.56	31.39

E. G. LOVE, Ph.D., *Gas Examiner.*

A NEW gas-light company is being organized at St. Johns, Mich.

THE Brush Electric Company of Cleveland, it is said, is building the largest dynamo in the world. It will be 12 or 13 feet long, 5½ feet wide, and weigh ten tons. It will give a current of 122,500 amperes; number of watts, 245,000. In other words, it will be four times the size and capacity of the "Jumbo" machine exhibited by Edison at the Electrical Exposition at Philadelphia. The latter was adequate to the task of running 5,000 16-candle power incandescent lights. This monster machine of the Brush Company will be shipped to Lockport, N. Y., and be used for the smelting of "aluminium." Five hundred horsepower will be required to drive it, which will be furnished by water with the aid of turbine-wheels.—*Electrician.*

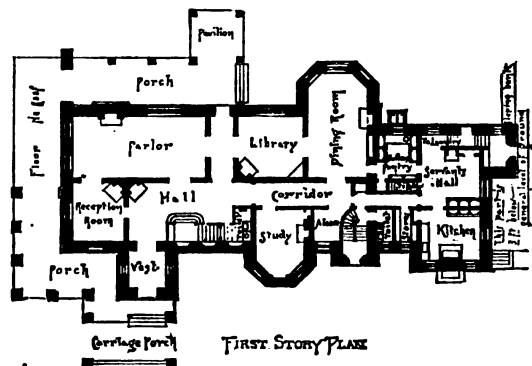
THE law reports of the *Journal of Gas-Lighting* give an interesting case of the Lewisham District Board of Works vs. the Crystal Palace District Gas Company to recover penalties for an excess of sulphur in the gas supplied by the company on March 25 and 29 last. The sulphur limit is 20 grains per 100 cubic feet. In the first instance the sulphur reached 37.37 grains, and in the second 25.53 grains, as determined by the gas examiner of the board. The tests at the gas-works on these two occasions give 16.0 and 17.68 grains. This unusual state of things was accounted for by the experts called by the defendants by supposing that naphthalene, which is deposited in mains and services during sudden changes of temperature, carries down with it some sulphur compounds which are liberated at once by other changes in temperature. The magistrate imposed a mere nominal fine.

IN November last the manufacturers of sulphate of ammonia in England formed an association known as the "Sulphate of Ammonia Producers' Association." At a recent meeting the secretary in his report stated that nearly 100 members were already enrolled. A table is given showing the gradual rise in prices for the first three months of this year. On January 1 the price in London was £10 10s., while on March 31 it was £13 7s. 6d. The report further states that "the cry of 'over-production,' so widely spread last November, does not seem to be borne out by facts. The markets of the world seem able to take all the sulphate of ammonia made at the present time, and this is proved by the fact that during the past three months 26,528 tons have been shipped from the nine ports from which we draw information, or at the rate of 106,000 tons per annum." Of this quantity 12,241 tons were shipped from London, and 6,826 tons from Hull; Hamburg took 10,248 tons, New York 503 tons, and Baltimore 142 tons.

OUR SPECIAL ILLUSTRATION.

COUNTRY SEATS NEAR PHILADELPHIA.

Of these the one designed by Mr. Addison Hutton, architect, of Philadelphia, is the residence of Mr. Isaac H.



THE SPECIAL ILLUSTRATION FACES THE SECOND EDITORIAL PAGE.

Clothier, at Lower Merion, Pa., near the Wynnewood station of the Pennsylvania Railroad. The outer walls of the house are built of Port Deposit granite, with linings of 8-inch brick-work, leaving an air-space. This brick lining takes the place of the wood furring, which is usual further north.

The granite is not dressed, and is relieved by cut-sills, copings, etc., of blue stone. The roof is of blue stone.

The other residence, the work of Messrs. G. W. and W. D. Hewitt, architects, of Philadelphia, is situated at Wynnewood, and is the country seat of Mr. Henry C. Gibson.

THE BACTERIOLOGICAL EXAMINATION OF WATER.

THE method of water investigation proposed by Koch and fully described in *THE SANITARY ENGINEER*, of November 27, 1884, has been hailed by sanitarians and others as a great advance and as giving us means of judging of the character of a water where chemical analysis fails. Already we read in water reports that one proposed source of supply furnishes water "two and a half times as good as another," because the analyst has found by the gelatin test twice and a half as many colonies in a certain bulk of one water as he found in the same bulk of the other. That no such absolute value can be placed upon the indications obtained is shown very clearly by Dr. G. Bischof in a recent lecture before the Medical Officers of Health. (See *Chemical News*, April 30, 1886.)

He says: "Organic carbon, and nitrogen, ammonia, nitric, and phosphoric acids, chlorine, and other bodies met in potable water have all in their turn been employed as analytical standards because they point to something, or at least are supposed to point to something, which is or may be injurious to health. The number of colonies, excluding for the present specific germs of disease, can likewise claim significance *only if they bear in some way an invariable, or at least practically invariable ratio to wholesomeness.*"

Bischof shows that there is no such ratio, although under like conditions, independent observers will obtain the same results from the same water. He calls attention to the influence which is exerted on the result by temperature and by light, and above all by storage. A water which contained fifty-three colonies (one of which liquefied gelatin), after six days' standing in a sterilized flask protected from all atmospheric contamination, contained 770,000 colonies per cubic centimetre (640 liquefying the gelatin). This was twenty times as many as were found in some of the same water which had been mixed with one per cent. of sewage and allowed to stand for the same time, and seventeen times as many as were found in a sample of Thames water taken at London Bridge.

Somewhat similar results were obtained by Dr. Leone, who found that in the Maugfall water of Munich, the five microbes per cubic centimetre in the water when first drawn become more than a hundred after twenty-four hours, in three days 67,000, and in four days 315,000. According to the manner in which the results of biological examinations are now interpreted by some, the Maugfall water when first drawn is many thousand times as wholesome as it is after standing four days in closed vessels.

Bischof concludes that the future of this method of research depends upon the ability of the biologists to distinguish between pathogenic and harmless organisms; that the mere number of organisms (whether liquefying gelatin or not) has no necessary or invariable connection with wholesomeness or pollution, and that although the test is most useful in special cases (see for example *THE SANITARY ENGINEER*, February 18, 1886, page 279), it requires development at the hands of biologists and pathologists before chemists and sanitarians can attempt to draw from it generally applicable conclusions.

THE new State Board of Health of Massachusetts is composed of the following members: Henry P. Walcott, of Cambridge, for seven years; Elijah U. Jones, of Taunton, six years; Julius H. Appleton, of Springfield, five years; Thornton K. Lothrop, of Beverly, four years; Frank W. Draper, of Boston, three years; Hiram F. Mills, of Lawrence, two years; James White, of Boston, one year.

Reviews of Books and Pamphlets.

ANNUAL REPORT OF THE NATIONAL BOARD OF HEALTH, for the year 1885. 363 pp., 8vo. Washington. 1886.

The report of the board occupies 18 pages of this volume, the rest of the book being filled with abstracts from consular reports, copies of circulars concerning small-pox issued by State boards of health, copies of the laws relating to sanitary matters of eighteen States, and a compilation of the mortality reports of certain cities and towns in the United States containing in the aggregate an estimated population of 10,246,695, for which the death-rate was 20.7 per 1,000. Consumption was the cause of the greatest number of deaths, being 13.4 per cent. of the total number.

The board recommends the re-enactment of the act approved June 2, 1879, with an amendment requiring all vessels sailing for ports in the United States to bring bills of health in accordance with the form adopted by the International Conference of Washington. It is also recommended that the restriction limiting the duties and investigations of the board now existing be removed. The estimates submitted call for \$35,320.

THIRTY-FIRST ANNUAL REPORT OF THE REGISTRAR-GENERAL OF SCOTLAND, for the year 1885. 87 pp., 8vo. Edinburgh. 1886.

From this report we learn that the population of Scotland, estimated to the middle of 1885, was 3,907,736 persons. During the year there were registered 126,110 births, 74,603 deaths, and 25,256 marriages, being in the proportion of 32.3 births, 19.1 deaths, and 6.5 marriages per 1,000 of population. This death-rate is the lowest on record for this country. In the principal towns the death-rate was 21.7, in the large town districts 19.5, in the small town districts 18.6, in the insular rural districts 16.0, and in the mainland rural districts 15.9.

The report on the vaccination of children shows that during the year 1884 86.33 per cent. of all the children born were successfully vaccinated, and a little over 9 per cent. died before any attempt was made to vaccinate them.

The report is illustrated with three diagrams, showing respectively the birth, death, and marriage rates in Scotland for each year from 1855 to 1885.

TRAITE D'HYGIENE INDUSTRIELLE a l'usage des medecins et des membres des conseils d'hygiene, par Leon Poincare. [Treatise on Industrial Hygiene for the Use of Physicians and Boards of Health]. 640 pp., 8vo. Paris: G. Masson. 1886.

The author of this book is the Professor of Hygiene in the Faculty of Medicine of Nancy, and his object is largely to instruct physicians as to the technical details connected with those branches of manufacture which are most likely to cause nuisance or danger to health.

He wisely remarks that in attempting to decide as to whether a particular establishment is dangerous to health, and especially in proposing remedies, it is necessary to understand the technical needs and difficulties of the business, to be acquainted with the machinery and apparatus, and to be familiar with the latest improvements—in short, to have a certain amount of trade education. The inspector, or representative of a Board of Health, who does not possess this knowledge may be treated with courtesy, but his suggestions will not be received with any special respect by the masters or workmen, and his examination will be looked on as a mere formality. The inspections of steam-boilers are almost the only ones of practical benefit, and they are so because they are made by engineers who fully understand the subject.

The dangers and nuisances connected with various occupations are divided into three classes—viz.: (1) Those which exclusively affect the public health; (2) those which affect the health of the workmen as well as that of the public; and (3) those which affect the health of the workmen only.

The first class produce their evil effects either by smoke or by residues or wastes. The second class includes dangers from fires and explosions, and those trades which produce dangerous and unpleasant gas, effluvia, or dusts. In the third class are placed those occupations which affect the workmen through the manual labor itself by accidents from machinery, excessive heat, defective light, and ventilation, etc., etc.

All these matters are discussed by Dr. Poincare in a general introductory section, after which he takes up in order the industries of each class, and briefly describes the methods and machinery of each, in connection with the sanitary precautions demanded, and the French law upon the subject.

He begins, for example, with those industries classed by law as specially dangerous, and in which it is absolutely forbidden to employ children. The first of these is the manufacture of nitro-glycerine, and of its various mixtures known as dynamites, of fulminate of mercury, and of gunpowder. After a short description of the methods of manufacture, the substance of the law regulating these occupations is given, and the chief precautions to be taken to prevent explosions are stated.

The first of the injuries described under the second class is the manufacture of aniline dyes, which is treated in like manner.

The book is well illustrated with over 200 wood-cuts, is handsomely printed on good paper, and we strongly recommend its purchase by sanitary officials as a standard work of reference.

Patents.

No. 340,826 is a patent heater for cars, rooms, etc., issued to Willard T. Sears, Boston, Mass.

No. 341,393 is a patent for a steam-pump issued to Cyrus Tufts, of Columbus, Ohio, in which the pressure in the chamber operates on a piston to open and close a throttle-valve for the purpose of starting or stopping the pump.

No. 341,440 is a patent chimney-protector issued to James H. Bailey, of Leading Creek, W. Va. It consists of a metal shield attached to the top of the chimney and swinging with the wind to prevent the latter cutting off the upward flow of the ascending gases of combustion.

No. 341,534 is a patent for a steam pump-engine, issued to Charles C. Worthington, of Irvington, N. Y., and consists of the combination, with the main cylinders and pistons forming the two sides of a duplex engine, and having connections by which the valve or valves of each side are operated by the other side, and a compensating cylinder or cylinders and piston or pistons for each side of the engine, which is or are arranged to act in opposition to the main piston or pistons during the first part of the stroke, and in conjunction therewith during the last part of the stroke, of an accumulator consisting of two cylinders of different diameters, and a differential plunger arranged between the compensating-cylinders and the source from which the pressure in said cylinders is derived.

No. 341,444 is a patent for packing for glass gauge-tubes issued to William H. Bray, Boston, Mass., assignor to himself and Daniel H. Howes, same place, and consists of a device for packing glass gauge-tubes, a coupling provided with an interior screw-thread at either end, the interior of the coupling between the threaded portions being blank or unthreaded, in combination with a nipple, a plug, a sleeve, and a glass gauge-tube.

No. 341,548 is a patent for a steam-trap granted to James H. Blessing, of Albany, N. Y., consisting of a closed vessel containing an open-top bucket, adapted to rise and fall in said vessel, a steam-inlet valve and a steam-exhaust valve which are arranged to open and close reciprocally to each other, an inlet water-pipe, and a syphon discharge-pipe, whereby the water is removed from the said bucket.

No. 341,721 is a patent for a steam-generator issued to Maria E. Beasley, of Philadelphia, for the combination, in a chemical-fuel steam-generator, of the generating-vessel, a fuel-holder contained therein, but accessible from the outside of the generator, and circulating-tubes passing through said fuel-holder.

No. 341,687 is a patent for a hydrant issued to Peter P. Quirin, of St. Clair, Pa., and consists of a hydrant-casing permanently sunk into the ground and a hydrant-body removably secured thereto, in combination with a depending skeleton frame secured to said hydrant-body, said frame being composed of two rigid parallel arms connected together by a plate at their lower ends, which frame is inclosed within said casing when the hydrant is in position for use, a valve-casing supported by the bottom plate of said depending frame, and a valve-operating rod and a water-discharge pipe extending upward from said valve-casing through said inclosing-casing and through said hydrant-body.

No. 341,591 is a patent for an air-heating apparatus for drying-rooms issued to John McCann, of Jersey City, N. J., for the combination, with the base and steam-inlet pipe and vertical ranges of steam-radiating pipes, of caps to such pipes and small vent-tubes grouped together, and a common vent or discharge tube or tubes.

No. 341,424 is a patent for a straight-way valve granted to Edmund Lunkenheimer, of Cincinnati, Ohio, assignor to Frederick Lunkenheimer, same place, and is the combination, in a straight-way valve, of oscillating operating-shaft, and vibrating carrier secured thereto, the valve adjustably pivoted in said carrier, the valve-seat, and a wedge or beveled projection with which the carrier engages to cause the valve to be forced to its seat.

No. 341,615 is a patent for a gas-heated baker's oven granted to William H. Thompson, of Leeds, County of York, Eng., assignor to the Thompson Gas Kiln and Oven Company, New York, N. Y. The combination, with baking-chamber, and a drop-flue extending across the chamber at one side thereof, and communicating with the chamber by the horizontally-extending slot, immediately below the top of the

chamber, of the burner-chamber and its contained gas-burners, a flue, extending transversely across beneath the chamber, and tubes or flues, connecting the flues, and extending side by side below the bottom of the chamber.

No. 341,813 is a patent drill machine issued to John C. Muirhead, Grub Gulch, Cal., consisting of a supporting-standard and adjustable sliding plate, which may be clamped to it at any point in its length, said plate having a semi socket or chamber to receive the lower part of the head of the drill-supporting arm, in combination with a dovetailed or channeled slide moving in corresponding guides in the plate, so as to fit over the upper portion of the head, and screws or bolts, by which it may be clamped or tightened upon said head.

No. 341,737 is a patent return steam-trap issued to Fred B. Eastman, of Waterville, Me., in which a steam-trap or water-elevator, has a combination with a steam-tight reservoir having two chambers, and a double-acting valve operated by a float by which steam is alternately admitted to and shut off from each chamber.

No. 341,705 is a patent for a steam-boiler issued to Henry H. Thornton, of Boston, Mass., in which a cylindrical shell of an upright boiler is provided with a tube-sheet, a fire-box inclosed within the said shell, a series of fire-tubes connected to the fire-box and the said tube-sheet, combined with a steam-dome, and with an internal steam receiver or drum.

No. 341,672 is a patent apparatus for purifying water issued to Isidore B. McCormack, of Chicago, Ill., and is the combination with a steam-generator and a condensing-worm, of an injector supplied from the generator and connected with the worm, and provided with an air-inlet opening, a retort or other generating apparatus, and a tube or pipe leading from the said retort and communicating with the injector.

Nos. 341,622 to 341,628 are patents granted to John B. Archer, of Washington, D. C., for boiler-furnaces and apparatus for generating gas in connection therewith.

No. 341,841 is a patent for a gas-test gauge issued to Elliott P. Gleason, of Brooklyn, N. Y., consisting of a tube, a scale, an inverted cup to hold mercury, and an indicator.

No. 341,815 is a patent for a pipe-wrench issued to Henry Newton, of Providence, R. I., assignor to himself and Herbert O. Johnson, of Boston, Mass., and is the combination of a pivoted hook-jaw and a hand-lever with removable serrated jaw-piece, made in L-form, and its attaching-screw.

PERSONAL.

DR. DIO LEWIS, the well-known writer on hygiene, died last week at Yonkers, N. Y.

ROSWELL P. FLOWER, prominent as a candidate for various National and State offices at the hands of the Democratic party, has been appointed by Governor Hill to the vacancy on the Electric Subway Commission of this city, caused by the death of Charles E. Loew. At a meeting of the commission last week he was made president.

MAJOR HIRAM E. SICKELS has been appointed a member of the Albany Board of Water Commissioners to fill the vacancy caused by the death of Judge Hand.

DR. ASHMUN, Health Officer of Cleveland, O., has been elected Secretary of the Ohio State Board of Health, and having thereupon resigned from his position on the Cleveland Board, has been reappointed at an increased salary.

DR. CYRUS H. THOMAS, in charge of the bureau of ethnology at the Smithsonian Institution, will begin a scientific investigation of the discoveries of mounds and other relics of prehistoric times, in the Monongahela and Chautauque Valleys.

NEW CATALOGUE.

WE have received the hot-water heating pamphlet of J. A. Fish & Co., of 93 Federal Street, Boston, Mass., showing the "Gurney" hot-water boiler and the special style of radiators used by the firm for low-pressure hot-water apparatus.

Association News.

CONNECTICUT ASSOCIATION OF CIVIL ENGINEERS AND SURVEYORS.—The ninth annual meeting was held at Hartford, May 26.

NATIONAL ASSOCIATION OF MASTER PLUMBERS.—A meeting of the Executive Committee of the National Association is held in Philadelphia this week. The session opens on Monday morning, the 31st of May, in the Girard House. The committee will complete all the arrangements for the National Association's meeting at Deer Park, and it is supposed the meeting will be in session about two days.

Notes.

For works for which proposals are requested, see also the "Proposal Column," pages 5 and 6

CONSTRUCTION.

WASHINGTON, D. C.—The first premium for the best design of a University building for the Catholic University to be erected near Washington has been awarded to Cluss & Schulze, of that city, and the second premium to Mr. O. Van Nerta, also of Washington.

WINONA, MINN.—City Engineer Fellows has submitted to the City Council a plan for improving the levees at a cost of \$25,000.

NORWICH, ONT., is about to vote on a by-law to authorize the Council to issue debentures to the amount of \$25,000—\$2,000 to bonus a roller-mill, \$11,000 for water-works, and \$12,000 for a new town hall.

ST. SAUVEUR, QUE., wants water-works. Plans are being prepared for building water-works here, and the corporation will borrow \$200,000 for construction.

MANSONVILLE, QUE., will be supplied with water by the Aqueduct Company, just incorporating. Address George Manson, director.

WORCESTER, MASS.—A bill has been reported in the State Legislature requiring the city to adopt measures for purifying its sewage before it is discharged into the Blackstone River. Four years from the passage of the act are allowed to carry out the necessary works.

BOSTON, MASS.—The State Senate has passed a bill authorizing the city to raise a loan of \$2,500,000 for the completion of its parks.

NORTH ADAMS, MASS.—Additions will be made to the water-service.

CHICAGO, ILL.—About \$140,000 it is estimated will be expended in repairing the Cook County court-house. E. R. Brainard has received contracts for \$98,000 of this amount, for taking down and resetting stone.

NORWICH, ONT., will vote on a by-law to authorize council to issue \$11,000 for water-works.

CHATTANOOGA, TENN.—The proprietors of the Lookout Mountain Water-Works are trying to make arrangements to supply water to the city. If successful, work will be pushed at once.

MINNEAPOLIS, MINN.—A design for a steel arch bridge has been completed at the office of the City Engineer. The new design has two arches, instead of one, as in the first design by Mr. Hilgard, with a pier in the centre. The roadway comes entirely above the arches, so that it is not in any way obstructed by them.

NEW LONDON, CONN.—This city has authority to borrow \$100,000 to be expended in building sewers. A sewerage board has been appointed. Mr. W. H. Richards, the present engineer of the water-works, is to be the engineer in charge; Mr. Rudolph Hering is the consulting engineer.

BOSTON, MASS.—Proposals for furnishing and driving piles for the foundation of the main building of the new Public Library on Dartmouth Street were received at City Hall May 28. The bids were as follows: Alexander McInnis, \$4.75 each; George H. Cavanagh, \$3.49; Boynton Bros., \$4; J. N. Hayes & Co., \$5; Benjamin Young, \$4.35; John T. Scully, \$3.95. The contract was awarded to George H. Cavanagh. Proposals were received May 28 as follows, for furnishing the labor and materials for building the foundation of the new public library building, Dartmouth Street: D. H. Cram, \$6.37 per perch of stone-work, and \$1,629 for grading and curbing; Michael Mahon, \$6.37, \$1,787; J. R. Stone, \$6.40, \$1,795; John Sutherland, \$6.45; J. E. McCoy, \$6.55, \$2,810; J. A. McLaughlin and J. Malone, \$6.50, \$1,875; R. R. Mayers, \$6.70, \$3,300; Donahue Brothers, \$6.95, \$2,800; Sampson, Clark & Co., \$7, \$2,906; Whidden, Hill & Co., \$7, \$3,600; Benjamin F. Dewing,

\$7.25, \$3,300; Edward Lynch, \$7.35, \$4,160; Boynton Brothers, \$8, \$5,625; Timothy Shea, \$8.35, \$2,800; W. R. White, \$8.55, \$2,475; Adelaide Phaneuf, \$6.39, \$1,875. The contract was not awarded.

The Water Committee of the City Council has voted to recommend the placing of a high-service system at Bellevue Hill and its vicinity, at the cost of \$45,000.

BALTIMORE, MD.—The contract for dredging in the harbor (estimated amount about 400,000 cubic yards) has been given to the Baltimore Dredging Company at eleven cents per cubic yard.

PHILADELPHIA, PA.—Proposals were opened at the gas-works for 500 lengths, twelve feet each, of 6-inch cast-iron gas-pipe of regulation weight, and the Gloucester Iron-Works and the McNeal Pipe and Foundry Co., of Burlington, N. J., each bid forty-three cents per lineal foot. The only bid received for the special pipe-castings required was from the McNeal Co., who bid 2½ cents per pound.

MESSRS. MOODY & BRACKEN, master plumbers, of 951 Sixth Avenue, New York, have been awarded the plumbing and gas-fitting of the Young Women's Christian Association Building of New York, for the sum of \$7,605.67.

BIDS FOR INTERIOR WOOD-WORK.—Cincinnati, May 29. The men employed by the furniture manufacturers of Cincinnati, several thousand in number, who struck work May 1, have not resumed. One effect of this is the readvertising for bids for interior wood-work of the new County Court House as an invitation to manufacturers in other cities, the Cincinnati manufacturers being unable to bid. Thus, the local manufacturers lose the chance of bidding on one of the largest contracts likely to be let in this vicinity for years. Bids will be received until Saturday, June 5, by the trustees.

GOVERNMENT WORK.

JACKSON, TENN.—Synopsis of bids for plumbing and gas-fitting materials for Court House, Post-Office, etc., opened May 28, 1886: J. D. Abrahams, \$1,180.80; William Kirkup & Sons, \$1,012.36; time to complete, two or three weeks; J. A. Bailey & Co., \$1,071.59, forty days; J. W. X. Brown, \$951.05, thirty days and sixty days.

THE Board of Public Works of Jersey City yesterday secured from Judge Knapp, of the Supreme Court, an injunction restraining the Pennsylvania Railroad Company from proceeding with the construction of a bridge across Newark Avenue, at Seventh Street. The laying of the foundation for the bridge abutments will seriously interfere with the 26-inch Passaic water-main that supplies the lower part of Jersey City.—*N. Y. Tribune* May 29.

ANN ARBOR, MICH.—A controversy has arisen between the Board of Review and the Ann Arbor Water Company as to the assessable property of the company within the city limits. The company's works are outside the limits and is assessed by the township officers at \$50,000. The Board of Review assess the pipes at \$50,000 more. The company claim that this last assessment is excessive and propose to contest it in the courts. They also set up the claim that the supply-mains are a part of the pumping works and reservoir upon which they are assessed in the township.

ALLENTOWN, PA.—Colonel H. H. Fisher, an extensive cast-iron pipe manufacturer, has failed. Judgments for \$57,000 have been entered, but the unsecured liabilities are largely in excess. The amount of his indebtedness cannot be ascertained until his indorsements are all known, but it is believed to exceed \$100,000.—*Philadelphia Inquirer*.

BOOKS AND PAMPHLETS RECEIVED.

FIRST ANNUAL REPORT OF THE CITY ENGINEER TO THE CITY COUNCIL OF THE CITY OF DES MOINES, IOWA, for the year 1886. Des Moines: Mills & Co., Printers. 16 pp. With maps and plates.

SIXTEENTH ANNUAL REPORT OF THE NEW BEDFORD, MASS., WATER-BOARD to the City Council of the City of New Bedford, Mass., December 31, 1886. New Bedford: E. Anthony & Sons, City Printers. 1886.

ANNUAIRE DÉMOGRAPHIQUE ET TABLEAUX STATISTIQUES des Causes de Dées. Par le Docteur E. Janssens, Inspecteur en chef du service d'hygiène de la Ville Bruxelles. 1886. Ve, J. Baertsoen.

ANNUAL REPORT OF THE ENGINEER TO THE BOARD OF PUBLIC WORKS OF THE CITY OF ST. PAUL, MINN. 1885. St. Paul: D. Ramaley & Son. 1886. With maps and plates.

FIRST ANNUAL REPORT OF THE BOARD OF HEALTH OF THE CITY OF NEWARK, N. J., for the year ending December 31, 1885. Newark, N. J.: *Advertiser Steam-Printing Office*. 1886. 47 pp.

THIRD ANNUAL REPORT OF THE SUPER-INTENDENT OF HEALTH OF THE CITY OF PROVIDENCE, R. I., for the year ending December 31, 1885. Providence: *Press Company*. 1886. 61 pp.

TOTTENHAM, ENGLAND, SANITARY ASSOCIATION. Twelfth Annual Report, 1885. Tottenham: Printed by C. Coventry. 10 pp.

THIRTEENTH ANNUAL REPORT OF THE WATER COMMISSIONERS OF THE CITY OF NEW BRUNSWICK, N. J. 1885.

REPORT OF THE BOARD OF TRUSTEES OF THE ROCKFORD, ILL., HOSPITAL ASSOCIATION, from its organization, December 15, 1883, to April 1, 1886. Rockford, Ill.: *Daily Register Print*.

BUTTER AND OLEOMARGARINE. Supplement to the Fourth Annual Report of the Massachusetts State Board of Health, Lunacy, and Charity. 1883.

OUTLINES FOR A MUSEUM OF ANATOMY, prepared for the Bureau of Education by R. W. Shufeldt, U. S. A. Washington, D. C.: Government Printing Office. 1885.

RULES, REGULATIONS, AND ORDINANCES governing the introduction, use, and the laying of private drains in connection with the use of sewers of the city of Milwaukee, Wis. Milwaukee: Ed. Keogh, Printer. 1886.

INSTITUTION OF CIVIL ENGINEERS. Excerpt minutes of proceedings: The Steam-Engine Indicator, by Osborne Reynolds, M. Inst. C. E.; and Arthur William Brightmore, Stud. Inst. C. E.; Construction in Earthquake Countries, by John Milne, F. G. S.; High-Speed Motors and Dynamo-Electric Machines, by John Imray, M. Inst. C. E.; and Gisbert Kapp, Assoc. M. Inst. C. E. Published by the Institution, 25 Great George Street, Westminster, S. W.

ANNUAL REPORT OF THE WATER-WORKS TRUSTEES OF THE CITY OF CLEVELAND, O., for the year ending December 31, 1886. Cleveland, O.: Peerless Printing Company. 97 pp.

NINTH ANNUAL REPORT OF THE BOARD OF HEALTH OF THE STATE OF NEW JERSEY, 1885, and report of the Bureau of Vital Statistics. Trenton, N. J.: John L. Murray, State Printer. 1885. 434 pp.

TABLES FOR CALCULATING THE CUBIC CONTENTS OF EXCAVATIONS AND EMBANKMENTS, by an improved method of diagonals and side triangles. By John R. Hudson, C. E. Second edition, revised and enlarged. New York: John Wiley & Sons. 8vo., 79 pp. Price \$1.

EXHIBITION OF DRAWINGS OF PUPILS OF THE SPRING GARDEN INSTITUTE.

PHILADELPHIA, May 28, 1886.

A REMARKABLY interesting exhibition is now in progress in the rooms of the Spring Garden Institute building at Broad and Spring Garden, consisting of a display of the works of the pupils in the mechanical and art schools of the institute, and is one that will well repay any one interested in the promotion of mechanics to visit.

In this school there are a large number of students ranging from fifteen years of age upward, who are receiving instruction in manual training in day and evening classes, and the display now in progress is a collection of the work done by these individual classes during the term.

The exhibition occupies both the second and third floors of the building, the mechanical department's display being on the second floor, and the art department on the third floor. The display in mechanical work embraces samples of wood and iron work of almost every character. In wood-work there are the various kinds of joints made of wood, of turnings in most intricate patterns, pattern making, etc., and in iron filing, fitting, cutting, etc., representing the primary departments. The advanced classes in iron-work have exhibits there that show a vast amount of ingenuity and skill on the part of the scholars. Among these are several miniature steam-engines of different patterns, a dynamo of 30-light power, portions of iron bridge-works which have been designed and constructed by the pupils, together with work of almost all character of skill down to the simplest. The walls of the mechanical room are lined with drawings of machinery and architectural designs of the scholars, giving evidence of much care and good instruction, while the work in the art department, on the third floor, is really surprisingly good when the fact is considered that the majority are by boys who have been receiving instruction but a short time. This institution was one of the first in the city to establish a school for manual training, and it has ever held the lead for excellence of results in training the rising mechanics to a more skillful use of the brain and hand in their profession.

The total number of pupils in attendance during the season of 1885-86 was 645, divided in the free-hand drawing classes, 372; architectural drawing, 43; mechanical drawing, 95, and in the mechanical handwork department, 135. The closing exercises of the school will be held on Monday, May 31, in the Institute Building.

ADDITIONAL PROPOSALS.

PROPOSALS for building court-house at Carrollton, O., until June 10. Address the County Commissioners at Carrollton, O.

BUILDING new cell-house for Wethersfield Prison, Connecticut, from June 15 to June 30. Plans at the office in Wethersfield. Address W. S. Bronson and R. T. Hewitt, Prison Commissioners, Hartford, Conn.

BUILDING INTELLIGENCE.

(Continued from page 6.)

NEW YORK CITY.—Continued.

962 Madison av, s w cor 76th st, 4-story and bmt br dwell; cost, \$25,000; o, a and b, Charles Graham & Sons, 305 E 43d st.

14 E. 80th st, 4-story br (stone front) dwell; cost, \$25,000; o and b, same as last.

101st st, n s, 260 e 3d av, 4-story br ten; cost, \$15,000; o, Harry Chenoweth, 345 E 92d st; a, J. C. Burne; b, not selected.

101st st, n s, 285 e 3d av, 5 4-story br tens; cost, each, \$15,000; o and a, same as last.

1567 4th av, 5-story br flat, with stores; cost, \$15,000; o, Lambert S. Quackenbush, 342 E. 87th st; a, John Brandt.

60th st, n s, 100 w 9th av, 10 5-story br (stone front) tens; cost, each, \$18,000; o, Peter N. and William H. Ramsey, 1675 Broadway; a, A. B. Ogden & Son.

72d st, s s, 300 w 8th av, 2 4-story and bmt br dwells; cost, each, \$25,000; o, Margaret Crawford, 956 3d av; a, G. A. Schellenger.

9th av, n w cor 60th st, 6 5-story br flats; cost, total, \$130,000; lessees, Steinhart & Son, 552 W. 50th st.

7th av, s e cor 124th st, 5 4-story br flats, with stores; cost, corner, \$15,000, and others, \$10,000 each; o, Walter S. Price, 232 W 132d st; a, Cleverdon & Putzel; b, not selected.

676 E. 145th st, 4-story br ten; cost, \$9,000; o, Herman Grieshaber, on premises; a, Joseph Wolf.

149th st, n s, 200 e Courtlandt av, 4-story br ten; cost, \$12,000; o, Theodore Wagener, 551 E. 151st st; a, M. J. Garvin; b, not selected.

178th st, s w cor Washington av, 1-story br church; cost, \$24,000; o, Board of Trustees New Methodist Episcopal Church of Tremont, John H. Buckbee, Tremont, chairman; a, L. B. Valk; b, Mead, Mason & Co.

BROOKLYN.

Stuyvesant av, w s, extdg from Jefferson av to Putnam av, 10 2-story and bmt (3 rear) b s dwells; cost, each, \$6,000; o, John F. Ryan, 187 Hewes st; a, Amzi Hill.

Lincoln pl, n s, 110 w 7th av, 3-story b s dwell; cost, \$16,000; o, Morris Building Co. (William Phelps, president). 26 Broadway, New York; a, Lamb & Rich, New York; b, Thomas B. Rutan.

24 Chapel st, 225 e Jay st, 4-story br apart house; cost, \$7,000; o, William McAuliffe, 294 Court st; a, George M. Walgrove.

Prospect st, s s, 50 e Charles st, 5-story br ten; cost, \$7,000; o, Samuel Miller, 159 Sands st; a, I. D. Reynolds; m'n, O. Nolon.

Lexington av, s s, 85 e Reid av, 14 2-story and bmt br dwells; cost, each, \$3,000; o and m'n, William M. Gibson, 939 Lafayette av; a, J. S. Stevens; con., C. M. Moore.

16 Dean st, 3-story br ten; cost, \$10,500; o, George Detthof; a and con., E. G. Vail.

184-88 Remsen st, 7-story and attic stone and br office bld; cost, \$101,000; o, Abial A. Low, 3 Columbia Terrace; a, Parfitt Bros; m, P. J. Carlin; c, Morris & Selover.

ALTERATIONS, NEW YORK CITY.

20 Bowery, n w cor Pell st, internal alteration; cost, \$6,000; lessee, Moritz Herzberg, 135 Allen st; a, V. H. Koehler; b, not selected.

642 5th av, altns, including elevator; cost, \$10,000; o, Mrs. Wm. D. Sloane, on premises; a, J. B. Snook; b, — McKeon and Hoe & Co.

2 W 52d st, part of bldg raised, internal altns, and hydraulic passenger elevator; cost, \$15,000; o, Mrs. E. T. Shepard, on premises; a, J. B. Snook; m, — McKeon; b, not selected.

BUILDING INTELLIGENCE.

121 2d av, internal altn; cost, \$8,000; o, Ferdinand Ehrhardt, 28 St. Marks pl; a, J. Kastner.

7 37th st, 3-story and bmt br exten; cost, \$9,000; o, Harriet S. A. Clark, on premises; a, E. T. Littell.

223 and 225 E 17th st, repair damage by fire; cost, \$60,000; o, Germania Life Ins Co., 22 Nassau st; a, J. C. Cady & Co.; m, Emanuel A. Thorp.

ALTERATIONS, BROOKLYN.

315 Washington st, e s, br exten; cost, \$9,346; o, Joseph Wurzler, 477 Lafayette av; a, M. J. Morrill; c, E. Hendrickson.

LATE NEW YORK BUILDINGS.

149th st, n s, 200 e Cortlandt av, br ten; cost, \$12,000; o, Theo. Wagener; a, M. J. Garvin.

S e cor 76th st and 10th av, flat and store; cost, \$25,000; o, Formir & Lother; a, Thom & Wilson.

76th st, s s, 25 e 10th av, 6 flats; cost, each, \$18,000; o and a, same as last.

90th st, s s, 200 w 2d av, br church; cost, \$15,000; o, Rev. W. J. O'Kelly; a, T. H. Poole.

21st st, s s, 230 w 9th av, br bldg; cost, \$70,000; o, General Theological Seminary; a, Chas. C. Haight.

ALTERATIONS.

18th st, s e cor Irving Place, factory; cost, \$30,000; o, John S. Huyler; a, Berg & Clark.

MISCELLANEOUS.

AMSTERDAM, N. Y.—W. J. Kline, of the *Democrat*, will build a 3-story building on Railroad st.

BIRMINGHAM, CONN.—W. Curtis will build a tenement-house; contractors, the Beardsley Building Co.

BALTIMORE, MD.—Bond, near Oliver, 2 3-story br dwells; o, Thomas H. Bleck.

Franklin and Eutaw, 3-story br store; o, Richard Walzl; a, Henry Brauns; b, — Andre.

200 E Baltimore, 3-story br dwell; o, Ida Fleming.

Ridgely, near Conway, 3-story br dwell; o, B. Franklin.

BIRMINGHAM, ALA.—A flouring mill will be built here. Address John M. Hunter, Columbia, Tenn.

BRATTLEBOROUGH, VT.—Library building; cost, \$15,000; o, city; b, Bartlett Bros., of East Whately.

Also society building; cost, \$10,000; o, Williams College; b, Bartlett Bros., of East Whately.

BARTON, VT.—A new Methodist church here.

COLDWATER, KAN., will build a \$10,000 city hall.

CLAREMONT, N. H.—Address Herbert Bailey about additions to hosiery mills here.

CROWN POINT, IND.—A church costing \$10,000 will be built here; August Bessler, of Chicago, architect.

CENTERVILLE, IOWA.—A Presbyterian church here; cost, about \$20,000.

CHESTER, PA.—F. Furness, 209 South Third Street, Philadelphia, is architect of the railroad depot to be built here. Bids just opened.

CHARLESTOWN, IND.—A \$25,000 woolen mill will be built here. Address J. N. Raymaker.

CHATTANOOGA, TENN.—Howard Ashton will build a large flouring mill on 10th st.

CLEVELAND, O.—104-112 Superior, 6-story bank bldg; cost, \$150,000; o, J. H. Wade; a, Samuel Lane; b, Thomas Simmons.

Sanford Ct, 7 2-story fr dwells; cost, abt \$2,500 each; o and b, L. Cody.

N e cor Scovill & Wilson, 2-story and bmt fr dwell; cost, \$12,000; o, J. H. Van Dorn; a, E. E. Sherwood; b, Thuener & Fath.

21-23 Frankfort, 3-story and bmt br, Power Block; cost, \$14,000; o, George Johnson; a, Cudell & Richardson; b, Kickheimer & Schenk.

BUILDING INTELLIGENCE.

Cor St. Clair and Wood, 4-story and bmt br lithograph block; cost, \$30,000; o, W. J. Morgan; a, Cudell and Richardson; b, L. Dautel.

758-60 St. Clair, 3-story br addn wire-works; cost, \$7,000; o, W. S. Tyler; a, Cudell & Richardson; b, C. Fath.

Perry, north wing and chapel in centre; cost, \$16,000; o, Little Sisters of the Poor; a, Cudell & Richardson; b, Kickheimer & Schenk.

Mr. Samuel Lane is now engaged on plans of a cathedral to be erected at Fort Wayne, Ind., to cost about \$250,000.

COLUMBUS, KAN.—A \$31,000 building will be erected here for court-house. Address M. Robeson, Chairman of Committee.

CINCINNATI, O.—Linn, bet Court and Clark, 3½-story br dwell; cost, \$12,000; o, A. H. Diekmann; b, John Pohlman.

122 Central av, 5-story br store; cost, \$12,000; o, O. Avery; b, H. Meiners & Son.

124 Central av, 5-story br store; cost, \$30,000; o, H. W. Derby; b, H. Meiners & Son.

McGregor av, Mt. Auburn, br dwell; cost, \$10,000; o, H. D. Peck; a, Charles Crapsey; b, Mackay & Walls.

Park av, Glendale, br and shingle dwell; cost, \$10,000; o, A. G. Clark; a, Charles Crapsey; b, S. W. Homebrook.

Spring and Liberty, br ten; cost, \$10,000; o, J. F. Baldwin; a, Charles Crapsey; b, William Wicken.

Vine and Front, br store; cost, \$10,000; o, Wiggins Estate; a, Charles Crapsey; b, James Griffith & Son.

The morgue at Cincinnati will be constructed after plans by Lonsdale Green, at a cost to Hamilton County of about \$10,000.

CHICAGO, ILL.—663-65 N. Halsted, br st and flats; cost, \$20,000; o, Kemper Bros.; a, Frommann & Jebson; b, Pauli & Becker.

204-6 Goethe, br dwell; cost, \$16,000; o, and a, L. Hallberg.

220-22 Wells, br st and flats; cost, \$30,000; o, George P. Brown; a, L. G. Hallberg; b, L. Doegling.

1191-1217 W 15th, 10 br cottages; cost, \$20,000; o, Thomas M. Crowley.

3539-41 Cottage Grove av, br st and flats; cost, \$12,000; o, Holton & Cobb; a, Oscar Cobb; b, W. Pound & Son.

90-92 13th pl, br dwell; cost, \$10,000; o, Christian Hoffman; P. W. Ruehl.

161-63 Milwaukee av, br st and dwell; cost, \$10,000; o, Gilbert Oleson; a, H. T. Kley.

294 Ashland av, br dwell; cost, \$10,000; o, M. M. Hirsch; a, Furst & Rudolph.

2510-12 Archer av, br st and dwell; cost, \$12,000; o, M. Meyer; a, Jacob Doerr.

468-78 N Clark, br theatre and stores; cost, \$80,000; o, Francis P. Owings and Howard T. Goldie; a, Oscar Cobb.

3328 Calumet, br dwell; cost, \$10,000; o, R. Nash; a, L. B. Dixon; b, W. & S. Nelson.

La Salle and Adams, 9-story and bmt granite and br office bldg; cost, \$1,000,000; o, E. C. Waller; a, Burnham & Root.

29-33 Hermann, br dwell; cost, \$13,000; o, William Schmidt.

2614-30 Cottage Grove av, br st and dwell; cost, \$32,000; o, E. H. Montgomery; a, J. H. Moore.

60 Scott, br dwell; cost, \$20,000; o, Robert Lincoln; a, S. S. Beman.

Also eight other permits between \$5,000 and \$10,000.

A. Boos has plans for a 3-story flat on Hammond st, for B. M. Schults; cost, \$15,000; also a 3-story and bmt dwell for B. Brosterhaus, on Mohawk, near Eugenie st; cost, \$10,000.

DUBUQUE, IOWA.—1300 Clay, 6 br stores; cost, \$10,000; o, John Bell; a, F. Herr; b, John Keenan.

DETROIT, MICH.—29 Griswold, br warehouse; cost, \$10,000; o, E. H. Moreton; a, G. W. Lloyd; b, Thomas Fairbairn.

56 Forest av, br dwell; cost, \$10,000; o, H. Knowles; a, M. L. Smith; b, J. Finn.

(Continued on page 20.)

THE SANITARY ENGINEER.

DEVOTED TO

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THE NEW YORK CHAMBER OF COM- MERCE ON RAG IMPORTATION.

WE publish on another page the substance of the report recently made by a special committee of the Chamber of Commerce of the State of New York, on the regulations of the Health Officer of the Port of New York relative to the disinfection of imported rags.

This report is the result of a prolonged inquiry, in which the importers of paper stock and other representatives of commercial interests presented their views on the one side, and the Health Officer and the proprietor of the patent disinfecting-apparatus, about which so much has been said in this connection, replied on the other. The conclusions of the committee seem to us to be fair and wise. If they were adopted and carried out they would certainly secure the country against all danger of the introduction of cholera germs by imported rags—which danger is, more- over, extremely small—and, on the other hand, though certain restrictions would be placed on commerce, and the cost of baled rags would be increased, the importers of rags and paper man- ufacturers would have no special cause for dis- satisfaction, because all would be restricted alike, and the burden of increased price of paper would fall equally on the consumers.

At the present time no protection of the coun- try from cholera is secured by the disinfection of rags enforced at Boston and New York; the effect is simply to drive this trade from these to other ports where such restrictions are not enforced; in other words, it levies a special tax upon certain importers, which tax is not imposed by formal legislation, but by three or four indi- viduals only.

The declaration of the committee, that quaran- tine regulations with regard to all imported merchandise, and not merely rags, should be uniform at all ports of entry in the United States, is a very sweeping one. That these regulations should all be under the one authority, and that authority the United States Government, we fully believe. We have no doubt of the authority of Congress under the constitution to exercise such supervision in the regulation of commerce. We also agree that, so far as the guarding against cholera is concerned, rags should be treated alike at all ports.

When, however, it becomes a question of reg- ulations to prevent the introduction of yellow fever through merchandise, the influence of cli- mate, and especially of temperature, on the spread of this disease is so important; and the differences in the degree of danger are so great, as between the New England and the Gulf ports, that we cannot say that quarantine regulations against this disease should be uniform.

It is, in any event, hopeless to expect any legislation by Congress on this subject until the country has been scourged by a great epidemic and public sentiment on the subject has been thoroughly aroused.

In the meantime, what is the duty of the health authorities of Boston and New York? Certainly it seems, in view of the facts pre-

sented in the report of this committee, that they should either compel the owners of the patent steam-disinfecting monopoly to charge only reasonable rates, or they should so modify their rules as to divide imported rags into two classes, one class known to come from infected ports, which should not be allowed to enter at all, and a second class not known to come from infected ports, which should be admitted without restriction, or at most after external disinfection in bulk by sulphurous acid fumes.

To persist in their present course will injure the cause of public health, without giving any compensating protection.

They should modify their present system, not from motives of personal expediency, but because they are damaging the commercial interests of two great ports, and benefiting no one except the stockholders of the patent disinfecting com- pany, whose interests are not worth considering in this connection.

WE commend the action of Mr. S. M. Ran- dolph, an architect of Chicago, to the engineer- ing and architectural professions. He was employed to prepare plans and specifications for the Soldiers' Home at Quincy, Ill. When the bids were received the lowest bidders based their bid on the specifications prepared by the archi- tect, *subject to a number of modifications and sug- gestions submitted by them.* The majority of the board, with the perverseness and short-sighted- ness so often found in building committees, decided to accept this lowest, though improper, bid. The architect protested against the un- fairness of the proceeding, and promptly resigned when the committee decided to award the contract in this irregular manner. This action of the architect and the proposal of the other bidders to contest the legality of the board's action resulted in the withdrawal of these lowest bids and the award of the contract on the original specifications and the reconsi- deration of the acceptance of the architect's resignation. While Mr. Randolph's action is no less than any high-minded architect or engi- neer should take, it is one that is often neglected in like contingencies. It is fair to assume that as this work progresses the architect's position will henceforth be properly defined and respected.

NOTWITHSTANDING the legal obstacles which Charles A. Buddensiek, builder, has been able to interpose in the way of his going to prison, he is at last in Sing Sing, paying the deserved penalty for the crime which his avariciousness caused. It will be remembered that he was convicted in May, 1885, of manslaughter in the second de- gree, because of the death of a workman caused by the fall of a row of his wretchedly constructed buildings in this city. He was bailed in \$30,000, and has been at large until his arrest a few days ago, due to the fear of his bondsmen that he was about to "skip" the town. He is now in Sing Sing on a term of ten years. So long as he was out he appears to have continued his

skin-building operations, and his apparent immunity was a standing encouragement to other speculative builders to do the same kind of work. Now that punishment has overtaken him, it may be that others will be warned, and a step in advance made toward the safety of the tenement population.

THE citizens of Bridgeport, Conn., should be ashamed of the conduct of the Building Committee for their new court-house. In a New England city, where one would expect to find enlightenment and progress, we find this committee asking architects to submit plans, specifications, and estimates for a building to cost \$110,000, the committee making the generous proposition that they "reserve the right to reject any or all plans without compensation, and employ the author of any design that they may accept, on such terms as may be agreed upon." It may be this committee know of somebody's

OUR BRITISH CORRESPONDENCE.

A Liverpool Magistrate's Opinion on Food for Pigs—Loan-ing Whitewash Brushes to the Poor—Report on the House of Commons Ventilation—An Engineering Journal from India.

LONDON, May 22, 1886.

THE Stipendiary Magistrate at Liverpool is of opinion that anything is good enough for pigs, and that diseased meat is suitable food for them. The Sanitary Inspector having summoned a butcher on account of certain meat, which he had found properly dressed as if for sale, in a shed on the butcher's premises, the defendant admitted the diseased state of the meat but pleaded it was purchased to feed his pigs on, calling evidence of the person from whom he purchased it to that effect. It would hardly seem necessary to dress meat before giving it to pigs, even if it be a desirable food for pigs.

A practice of loaning brushes for whitewashing obtains in Burnley and Stoke-on-Trent, which commends itself to local sanitary authorities. It is, of course, seldom that members of the poorer classes are the possessors of

to the House of Commons the results to which they have already arrived, partly from their own investigations and partly from evidence received on the important question submitted to them. The committee are convinced that the air of the Palace of Westminster is subject to contamination by sewer-gas emanating from the low-level sewer of the main drainage of the metropolis with which the system of drainage of the palace is in direct connection. Undoubted evidence has been obtained that sewer-gas from this source passes into the drainage system of the palace in times of flood, and under the circumstances, owing to the absence of proper ventilation in the low-level sewer above referred to, and to other causes, the committee are convinced that a complete reconstruction of the main drain passing under the Houses of Parliament, and an entire alteration of the means of discharging the sewage from the palace into the main low-level sewer are urgently required for the safety of the members of the Legislature and of the officers residing within the precincts of the palace. The committee will be prepared in due course to report in detail as to the measures which in their opinion may best accomplish these necessary objects. Such works, how-



TWO SUBURBAN HOUSES AT BUFFALO, N. Y.—GREEN & WICKS, ARCHITECTS.

plan that they want to adopt, and that this asking for plans is merely a blind to satisfy certain taxpayers. If so, their conduct is dishonest. If they really hope, on the other hand, to get any decent design in the way that they propose to, they must be unusually ignorant about such matters, as they evidently have a very poor opinion of the value of a competent architect's services and time, in expecting architects to go to the trouble of making complete plans and specifications without any payment for such services. We respectfully refer this committee to the methods adopted by the Kansas City Exchange Building Committee, to secure plans for a Board of Trade Building for that city, the terms of which will be found on page 465, issue of April 15, 1886, of THE SANITARY ENGINEER. We really expected better things from Bridgeport.

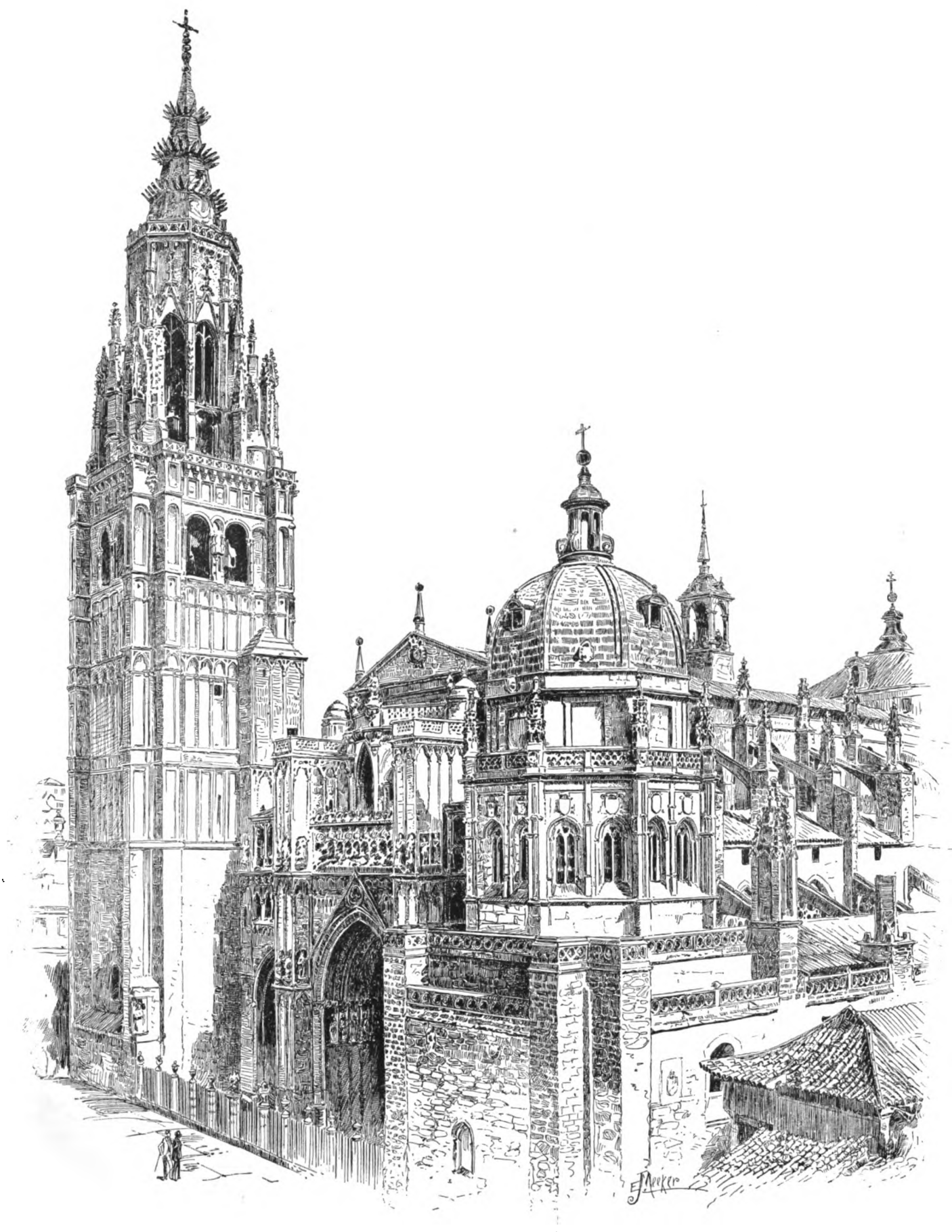
brushes suitable for whitewashing purposes when the sanitary inspector has directed such a step, neither are they in a position to purchase the necessary articles or to pay for the work being done by others. To meet the necessities of the case the sanitary authorities of these two places have stored a large number of brushes which they loan at a nominal sum—1d. (two cents) I believe. They also supply whitewash. It is in the discretion of the inspector whether he shall loan these brushes and give the wash without charge where it seems needful. Apart from the fact that the amount realized from the hire is more than sufficient to pay for the articles, it is a wise step on the part of the local sanitary authorities, as it minimizes the objections on the part of the poorer classes on the score of trouble and expense, and encourages them to keep their places clean without waiting for the visit of the inspector.

I have several times referred to the bad condition of the House of Commons. The following is the preliminary report of the Committee of Ventilation of the Houses of Parliament, presented by Sir Henry Roscoe: "The Committee on the Ventilation of the Houses of Parliament desire to report

ever, can only be conveniently executed when Parliament is not in session. In view of the urgent nature of the case, the committee are of opinion that immediate steps should be taken to carry out temporary but effective measures for preventing, as much as possible, the recurrence of the evils complained of. The committee, therefore, beg to recommend to the House that Her Majesty's Board of Works be instructed, with the co-operation of the members of the committee, at once to carry out certain remedial measures which the committee are now prepared to suggest, and which in their opinion will effect the desired result."

The "Indian Engineer" is the title of a new paper published in Calcutta, of which I have received the first number. The title speaks for itself as to the objects of the publication. The matter is clearly and intelligently written, and of considerably variety. There is, undoubtedly, demand for a local paper of this class, and it is to be hoped that the new venture, if carried out on the lines of the first number, will enjoy a longer life than its many predecessors.

SAFETY-VALVE,



THE SANITARY ENGINEER ILLUSTRATED SERIES.

THE CATHEDRAL OF TOLEDO, SPAIN.

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OUR SPECIAL ILLUSTRATION.

THE CATHEDRAL OF TOLEDO.

THE Cathedral of Toledo was commenced about the same time as that of Burgos, but on a larger scale, being, with the exception of Seville, the largest of Spanish mediæval cathedrals. Its internal dimensions are: Length, including a moderately sized chapel at the east end, 350 feet; width throughout, 174 feet; height of principal nave and transept, 120 feet. The width is divided into five aisles, those on the outside rising to about two-thirds the depth of those next the centre, and those to about one-half the central aisle. We take the above facts from Fergusson's "Handbook of Architecture."

OUR ILLUSTRATION OF A MODERATE-COST-HOUSE.

TWO SUBURBAN HOUSES AT BUFFALO, N. Y.—GREEN & WICKS, ARCHITECTS.

THESE houses stand side by side on Franklin Street, Buffalo. The house to the right of our illustration is that of Dr. Floyd Crego; the other is Mr. H. B. Stimpson's. Dr. Crego's house is built of Buffalo stock brick, with Medina stone trimmings. The first story is raised over a low basement. The front entrance is to the basement descending a few steps. The doctor's office is on the left of the entrance. Over this entrance is the morning-room. The house entrance is on the side, as is shown on the plan. This house cost about \$9,000.

The first story of Mr. Stimpson's house is of brick. The second story is shingled, with some half-timbered work, filled in with cement and whitewashed gravel. The cost of this house was \$12,000.

The architects of both houses were Messrs. Green & Wicks, of Buffalo.

RIVER AND HARBOR IMPROVEMENTS.

COLONEL WILLIAM P. CRAIGHILL, U. S. Engineers, has given, in response to the request of the Baltimore *Sun*, his views at length on the subject of river and harbor improvements, which we here quote. They are commended to that class of persons who hastily jump to the conclusion that appropriations for river and harbor improvements are extravagancies, and should be denounced as "jobs."

"The river and harbor bill, when annually under discussion in Congress, is generally vigorously criticised in the metropolitan newspapers, and the cue is taken from them by the provincial press. As was well remarked by Hon. Mr. Wilson, of West Virginia, in a recent speech in Congress, 'much of the criticism indulged in by the press of some sections of the country, and echoed in the debates on this floor, is unfounded and uninformed.'

"These criticisms are usually of a very general character and very seldom go into details. The truth is that no bill on any subject containing many items is going to be free from objections so long as men are legislators and so many diverse interests are to be considered. If river and harbor bills be analyzed, it will generally be found the percentage of improper items is very small.

"A great prejudice has grown up in the country with reference to this matter. Thorough ventilation would do great good. A rule reported to have been lately adopted in the Senate is an excellent one, requiring their committee on commerce to give reasons why each item they recommend should be appropriated for. This will cause a thorough discussion and scrutiny of each item.

"It is very doubtful whether a single one of these objectors ever read through a river and harbor bill, although very ready to talk about 'mud-puddles,' etc. We heard recently from an influential quarter a sneer about the improvement of the 'roaring Kanawha.' This gentleman, well-meaning, but 'uninformed,' as Mr. Wilson remarked, does not know that the Kanawha is in its ordinary stage as great a river as the Seine of Paris, and flows through one of the finest coal-fields in the world. It is derided, because in the low water of summer some of the shoals are impassable except by vessels of very light draft. But there is abundance of water in the river at all times if properly utilized to make a navigable depth of not less than six or seven feet at the lowest stages, and to do this is the object of the improvement.

"This is a short river, entirely within a single State, and yet its improvement is a subject of national importance, as was clearly stated by Mr. Wilson, from whose speech, already referred to, the following quotation is taken: 'Even in a greater degree is this true of the

amount expended for the Great Kanawha River. While the locks and dams which have been placed upon that stream have during their construction given temporary employment to labor in West Virginia, and have developed a line of magnificent collieries along that river, these improvements have also provided an outlet for the products of those mines, and permanently cheapened coal to the dwellers along the Ohio and Mississippi, and the few hundreds of thousands of dollars expended in this work, which, according to the gentleman from Iowa, is local, have thus extended their benefits to many surrounding States.'

"I will continue this subject by an extract from another and recent speech in the Senate, which contains most important statistics and arguments:

"In a newly-settled country the natural water-courses are the only highways available for heavy transportation. As population increases and the country is developed, railways are built, and, for a time, they can do all the business required, thus apparently superseding water transportation altogether; but as the wealth and density of population still further increase, the necessity for water transportation again asserts itself. So true is this that now on all sides we find a cry raised for the improvement and greater use of waterways. The necessity for paying increased attention to our inland navigation has been forced upon the public in this country by the combination which railway companies have managed so skillfully to arrange and work for their exclusive benefit. It is not in this country alone, however, that a tendency to revert to the older means of transit is noticeable. Throughout the world of commerce the desire for more direct means of conveying goods in bulk prevails.

"By the cession of Alsace and Lorraine France lost the connection between the northern tributaries of the Rhone and the Rhine, which were united at Strasburg. She set to work without delay to reunite these two lines of communication by a new canal, constructed on their side of the Vosges, the estimated cost of which was sixty-five million francs. This work must now be complete, or drawing toward completion. Even the Russians have been at work converting St. Petersburg into a seaport by a canal twenty miles in length. At the mouth of the Danube and the Mississippi great improvements have been carried out with marked success, giving to the Danube twenty feet of water in place of nine feet, and increasing the low-water depth of the Mississippi from eight feet to thirty feet, with the result that the exports from New Orleans have increased many fold. Manchester is about forty miles from Liverpool, with six lines of railway connecting the two cities, yet it is proposed to connect the two cities by a ship-canal to cost \$40,000,000, as the numerous railway lines are considered insufficient to transport economically heavy and bulky merchandise. In this connection I desire to read a statement by Major W. R. King, one of the ablest of the corps of engineers of the United States army:

"This is evident from the experience of older countries, for although we are in our own estimation a wonderful nation, we are not exempt from the laws of nature, will probably obey 'manifest destiny' about as others have done before us, and we are not so wise but that we may profitably take lessons from their experience. France, for example, with an area of about four-fifths as large as our State of Texas, and a population thirteen times denser than that of the United States, has 18,000 miles of railway, or about one mile of railway to eleven miles of territory, while the United States have only one mile of railway to twenty-nine miles of territory.

"Notwithstanding these facts and the enormous strain upon her finances for war expenses and indemnity, France is expending sums on her waterways that would make our short-sighted economists howl with alarm. For rivers she proposes to expend \$13,200,000; for canals, \$142,600,000; for harbors, \$20,000,000, making in all \$175,800,000 to be expended in the immediate future for these improvements—a sum larger than all that has been expended for rivers and harbors by the United States since the foundation of the Government. This last, including all unexpended balances, amounts to only \$136,112,576, and if we include the \$31,021,423, which covers all that has been expended by States and private corporations for river improvements, so far as can be ascertained, the amount would still be only \$167,134,000, or \$8,000,000 less than this one appropriation by the French.

"Germany affords another excellent example of how river navigation ought to be developed. With an area

almost equal to that of France, and only one-seventeenth as great as the United States, she has fifteen times our density of population, and a mile of railroad to every nine square miles of territory, instead of one to 29, as we have. She finds it advantageous, however, to expend far greater sums for river improvements than the most enthusiastic advocate of internal improvements would think of expending on our rivers. On one stream not as large as some of the branches of the Tennessee, say the Holston or Clinch, she has expended \$20,000,000, and I am informed that a cable-towage company on one of these rivers, which is too rapid for ordinary navigation, has a chain cable 100 miles long, which enables boats to make regular trips according to schedule and carry freight at about half a cent per ton per mile, for short as well as for long distances. This towage company pays six per cent. dividends on its capital stock, which is considered a good investment in that country.

"Among the advantages of river improvements may be mentioned: (1) They furnish means for the transportation of heavy and bulky commodities, such as coal, iron ore, scrap, and pig-iron, stone and timber, which often will not pay the cost of transportation by rail; (2) They keep in check the grasping tendencies of railway companies by controlling freight rates and facilities."

WROUGHT-IRON CONDUIT-PIPES.*

WROUGHT-IRON pipes are largely in use in the Pacific States and Territories of the United States as water-conduits; cast-iron pipes are only used for city distributing-mains, where frequent connections with service-pipes are required. The adoption of wrought-iron for this purpose was due to the following causes, and affords an apt illustration of the old proverb that necessity is the mother of invention. The method of hydraulic mining was introduced or invented in California in 1852. It may roughly be defined as the discharge of jets of water, actuated by gravity with a considerable head, against a bank of auriferous gravel, the water acting first as an excavator and afterwards as a carrier of the washed material. The supply of water for these jets at first was conducted through hose made of heavy cotton duck cloth, which was strengthened by outer nettings of cordage when the pressure was large. This hose was costly and short-lived. It was not practicable to use pipes made of cast-iron—first, on account of the prohibitive cost of transportation over steep mountain roads and paths to the mines; and second, because heavy cast-iron pipes could not be cheaply and quickly moved from place to place in the mine, the exigencies of such mining requiring frequent changes in the position of the supply-pipes.

In 1853 an ingenious miner laid in his mine a line of pipe consisting of joints of ordinary stove-pipe, made of very thin sheet-iron, lightly fastened together with cold rivets, with the joints united stove-pipe fashion—i. e., the end of one joint being tightly shoved into the larger end of the succeeding joint, with the smaller end pointing down stream. This experimental pipe was some five or six inches in diameter. The pipe answered the desired purpose admirably, and in a comparatively short time all the many hydraulic gravel mines in California obtained the pressure for their water-jets by means of thin sheet-iron pipes. As hydraulic mining increased in magnitude the sizes of these supply-pipes also increased, the diameter for main lines for a large mine being from twenty-two to thirty inches. These pipes, as a rule, are made at the mine, the requisite machinery costing less than £100. The iron is 0.065 to 0.134 inch (Nos. 16 to 10, Birmingham gauge) in thickness, with a double row of cold rivets for the longitudinal seam when the pressure is to be large. The only test made of the quality of the iron is the judgment of the pipe-maker, who can generally discover and reject sheets of bad quality by defects manifested when the plates pass through the rolls; in fact, this is one of the chief reasons why the mine-owners have preferred to make the pipes themselves. The length of the separate joints is from eighteen to twenty-five feet, one end being slightly smaller than the other end. As a protection against rust each joint is immersed for several minutes in a bath of boiling asphaltum and coal-tar; a little rosin is added when a glassy surface is desired, and sometimes a little fish-oil. This immersion results in the thorough coating of the pipe, both inside and outside, and is vastly superior to any application of paint. When the pipes are coated properly the protection appears to be perfect. The several joints

* A paper read by Mr. Hamilton Smith at the spring meeting of the British Iron and Steel Institute and reported by *Iron*.

are then joined together, stove-pipe fashion, the lower joint being shoved firmly into place by jack-screws. When the fit is slack, a piece of tarred canvas is wrapped around the small end; wedges of soft pine wood are sometimes driven in where the fit is a bad one. Such pipes are laid on the surface of the ground, and can be put together or taken apart with great ease and at small expense. When a line of such pipe is laid by skillful men with ordinary care, although the length may be several thousand feet, with a pressure at the lower end as great as 450 feet, there are but trifling leaks, which generally can be stopped by putting sawdust into the inlet end of the pipe. As an illustration of the tightness of such rough joints, I may instance a main laid by me for supplying water-power, having a length of two miles, and a maximum pressure of 550 feet. The leakage from this pipe did not average more than three or four cubic feet per minute, although the only protection from changes of temperature was a couple of boards tacked together and placed over the pipe.*

After successful practice in the mines had demonstrated the advantages and capabilities of wrought-iron pipes, they were used for permanent conduits both for conducting water to mining districts across deep mountain gorges, and also for the supply of cities. San Francisco, a place of some 300,000 inhabitants, receives its water through two lines of such pipes, and a third pipe, many miles in length and of large diameter, is now being laid for an additional supply. For permanent conduits the joints of a pipe of considerable diameter are generally riveted together; for small diameters with high pressures lead joints are used. Such conduits are, of course, placed in trenches, and covered with earth in order to avoid excessive alternations in contraction and expansion; slip-joints need not be used, as the pipes are sufficiently elastic to permit changes in length due to variation of the temperature of the water. The following statement will illustrate the Pacific coast practice with conduit-pipes, the flow in all cases being caused by gravity:

Name.	When laid.	Length.	Diameter.	Maximum Pressure.	Maximum Tensile Strain on Iron.	Description of Pipe.
		Feet.	Inches	Vertical Feet of Water	Lb. per Square Inch.	
Cherokee	1870	12,798	30	837	17,549	Plate iron, double riveted.
Virginia City	1872	37,100	11	1720	about 15,000 (?)	Plate iron, double riveted.
	1873	37,100	10	1720		Lap-welded tubing; outerscrew couplings.
Texas Creek	1878	4,430	17	760	about 18,000	Plate iron, double riv. ted.
Humburg	1868	1,194	26	120 (?)	11,500	Single rivet'd iron 1½-inch in thickness; two pipes each twenty-six inches diameter, laid side by side.

The two Virginia City pipes are laid side by side. The lead joints for the riveted pipe under the enormous pressure of 1,700 feet at first gave considerable trouble; the lap-welded pipe gave no trouble whatever. The general tensile strain on the Texas Creek pipe is about 16,500 pounds per square inch. The oldest of these pipes—the two across Humburg Cañon—are notable for having been laid seventeen years ago of iron single-riveted only 1½ inch in thickness; when I last heard from them, a few months ago, they were reported to be in good order. The other pipes are also stated to be now in excellent condition. The iron for the Virginia City and Texas Creek riveted pipes was of very inferior quality; the iron for the Cherokee pipe was of ordinary quality; yet it will be observed these pipes have for many years past been subjected to tensile strains which must seem almost fabulous to one only accustomed to cast-iron water-pipes. So far as rust is concerned, in my extensive experience I have only seen one notable instance where an asphaltum coating properly applied did not protect the iron, and that was with a pipe over which passed a stream of water highly charged with sulphate of iron. I may also remark that when iron has once been attacked with salt rust from sea-water it seems to be very difficult to prevent further rust. The California experience with double-riveted pipe, made of a superior article of plate-iron, can thus be summed up:

* The extreme range of temperature was from 10° to 107° Fah. in the shade.

Such pipes can be with entire safety subjected to a constant maximum tensile strain of 16,000 pounds per square inch. For a period of twenty years an asphaltum coating has prevented rust, and also the formation of interior tubercles where soft water flows through the pipe. Lap-welded iron tubes of sizes up to 15 inches in diameter are now largely used in the United States for conduit pipes, and will safely stand a strain of about 20,000 pounds per square inch. They are almost exclusively used in the Western mines for pump columns, owing to their combined lightness and strength. The lines of pipe through which petroleum is pumped from the Pennsylvania oil-wells to the sea-board are made of this tubing, the diameter generally being six inches.

The query presents itself, Why should not wrought-iron, or, still better, steel, be used for conduit-pipes in preference to cast-iron? If it answers the desired purpose in California, why should it not do so in other parts of the world? To one like myself, who has for years been accustomed to the Californian practice, it seems as irrational to build a pipe carrying water under considerable pressure of cast-iron, as it would be to build a suspension bridge with the supporting chains made of cast-iron. Experience in the United States has shown that the practicable limit of size for cast-iron mains is a diameter of about four feet, even when the pressure is less than 100 feet. It is evident that a pipe of wrought-iron or mild steel can be safely made of almost any desired size, and this may be of much advantage if it be desired to conduct a large supply of water through pipes for city or other use. For instance, with an inclination of three feet per mile, a single pipe 8¼ feet in diameter will carry 280 cubic feet per second, while seven pipes, each four feet in diameter, would be required to transport the same quantity of water with the same inclination. The cost of the large pipe made of steel or wrought-iron would be considerably less than one-half the cost of the seven small pipes made of cast-iron. The ideal conduit for high pressures is a welded steel tube; such tubes could probably be subjected to a tensile strain of 25,000 pounds with perfect safety, and would be much preferable to riveted pipe, not only on account of superior strength, but also by reason of almost perfect interior smoothness. It seems to me that this question is well worthy of the attention of British steel-makers and hydraulic engineers. The adaptation of a superior and cheap metal such as mild steel to conduits will permit the construction of hydraulic works in many parts of the world which now appear to be impracticable, owing to the cost of many of the methods still in use for the transportation of water.

In the debate Mr. J. Riley said that about twelve years ago Mr. Russell Aitken proposed to the municipality of Bombay a very extensive scheme to bring water a considerable number of miles to the city, and to make the main of steel. It was looked upon as rather a mad scheme by a good many people, and consequently it hung fire. Only in the present year had the municipality decided to extend its water-works, and it had gone in for a cast-iron main, the order for which was taken by a Glasgow firm. A few years ago his firm were visited by some gentlemen from New York, who had a scheme for a main to increase the supply of water to New York City. It was intended that the main should ultimately be 80 miles long. He went carefully into the matter with them, prepared estimates as to the cost, and made all arrangements for supplying the main if the scheme was completed. About 30,000 tons of steel would have been required for it, but the scheme had not yet come to fruition. Under the guidance of one of the American gentlemen, he made 100 tons of pipe 13 inches in diameter, and 1½-inch thick, which was sent out to the Central States of America. There was subsequently some talk of a large main for New South Wales, and he proposed to the engineer that it should be of steel, and said he would undertake to supply it, ship it, and deliver it in New South Wales at a considerably lower cost than it could be obtained of cast-iron. He believed that eventually a portion of that main was constructed of wrought-iron, but he did not know if it was finished yet. Following that came the Bombay scheme, which he tried to turn in the direction of steel, but failed. Last of all, he worked constantly on the largest scheme that had been heard of in this country—namely, the scheme for the supply of water to Manchester from Thirlmere. He submitted to the engineer of that scheme a proposal to make the main of steel; but the suggestion was not carried out, because they wanted experience of how the plates would stand in the matter of corrosion. If he could have pointed to any experience to remove the doubt on that point, or if the engineer would have taken the responsibility, he believed they would have had an example in this country of the largest steel-main ever constructed.

Mr. E. A. Cowper said perhaps it would be interesting for him to mention that the Kimberley water-works had a 14-inch main, only one-quarter of an inch thick, and 18 miles long, and it had been most satisfactory.

[The author of this paper has omitted to mention two notable instances of the use of wrought-iron water-pipe in the Eastern States.

In 1860 the Croton Aqueduct was carried over the High Bridge spanning the Harlem River by a riveted plate iron pipe 7½ feet in diameter and 1,400 feet long. The pipe is built of plates half an inch thick and 6x8 feet in dimension, the edges planed and abutted and the joints covered with straps of half-inch iron 9 inches wide, riveted to the plates, the rivet-heads being countersunk on the inside of the pipe. This pipe has stood well for twenty-six years.

Between 1870 and 1876 four separate pipes of wrought iron were laid across the Harlem River, submerged, to supply islands and Morrisania, three of them being 6 inches and one 10 inches in diameter. These pipes are inclosed in wooden boxes and filled around with hydraulic cement to protect them from the action of the salt water.

In 1873 the conduit for bringing water to the city of Rochester, N. Y., was laid of wrought iron pipe of 36 and 24 inches in diameter for 12½ miles, part of the line being under 320 feet head. After twelve years' service this pipe is reported to be in good condition.—ED. SAN. ENG.]

SOME DETAILS OF DOMESTIC ENGINEERING IN THE POTTER BUILDING.

THE accompanying sketches illustrate some novel details of construction found in the Potter Building, Park Row, New York City.

The building occupies that part of the block between Park Row and Nassau Street, facing on Beekman Street, but the principal façade is on Park Row. It is probably the highest building in New York, being eleven stories above the basement, and is intended to be as nearly fire-proof as it is possible at the present day to make it. The doors, the floors, and the window-sashes only are wooden, the window-frames being cast-iron, and the wooden sashes covered with wrought sheet-iron on the Nassau Street (narrow street) side of the building. The wainscoting and base, or mop-boards, are of marble on the lower floors, and on the upper floors, commencing with the third, they are made of Keene's cement molded on. The water-supply of the building has its peculiar features. Drinking-water and water for basins is from the Croton supply. Water for the water-closets and urinals is pumped from a well on the premises, and the roof-water is also saved and run into the tanks.

To trace the Croton water from the street to its use to the basins we will commence with Fig. 1, which is a plan and section of a portion of the basement. The pipe shown in the vertical section as coming through the pier is behind it, and comes from the street four inches in diameter. This, it will be seen, supplies both reservoir and pump. In this building a problem here interposed, which called for something out of the regular routine. The object of the reservoir is to provide a supply of water for the building and the boilers should the street supply be shut off. The reservoir is of brick, lined with cement, and occupies one of the cellar rooms of the building. The next adjoining room, which intervenes between the pump-room and the reservoir, is likely to be used as a Safe Deposit Vault, and consequently it could not be entered by the person in charge, and to make a circuit of the building every time the engineer desired to know the condition or the height of the water would be inconvenient and impracticable. So the arrangement shown in Fig. 1 was devised. The pipe from the street was tapped back of the main-valve, as shown, and a second service carried to the filter. From the filter then the pipe returned into the suction of the pump, allowing the water to flow either to the pump or into the tank, the main-service valve being closed. From the pipe, where it leaves the filter, a stand-pipe is attached which shows the level of the water in the reservoir. Within this stand-pipe is a copper float which connects with a cone-valve or special cock in the supply to the filter. This arrangement has a two-fold object: it keeps the reservoir filled automatically to its proper level, and when the pump is started it responds at once by the draught on the pump-suction. The filter is composed of a thick sheet of fur felt placed between iron covers. Two pipes enter it and two leave it. The supply from the street enters beneath the felt and a pipe from the roof-tank enters above. The outlets from it are one pipe to the pump (suction) and one from it to the sewer, they also being from opposite sides of the felt. These pipes are provided each with a slide-valve, all in the same plane and all connected by rods with a common lever. When in the

judgment or experience of the engineer it becomes necessary to cleanse the filter the lever is thrown to the left (see plan) for a few moments, closing the street-supply and the pump-suction, opening the pipe from the roof-tank and the sewer-pipe, when the water-pressure from the roof passes backwards through the felt, washing the sediment from it. The object of connecting all the valves to one lever is obviously to prevent the possibility of wasting the water by stupid or ignorant manipulation. The water from the pump (drinking-water, etc.) is forced to six cedar tanks on the roof of the building. These tanks are circular, five feet in diameter by four feet deep, and are connected together at their bottoms by brass leveling-pipes.

The water for the basins is supplied direct from these tanks, the pressure on the first floor being fully sixty-five pounds per square inch. The water for the water-closets, as before stated, comes from a well. It is pumped by a small pump continuously into a brick reservoir in the basement

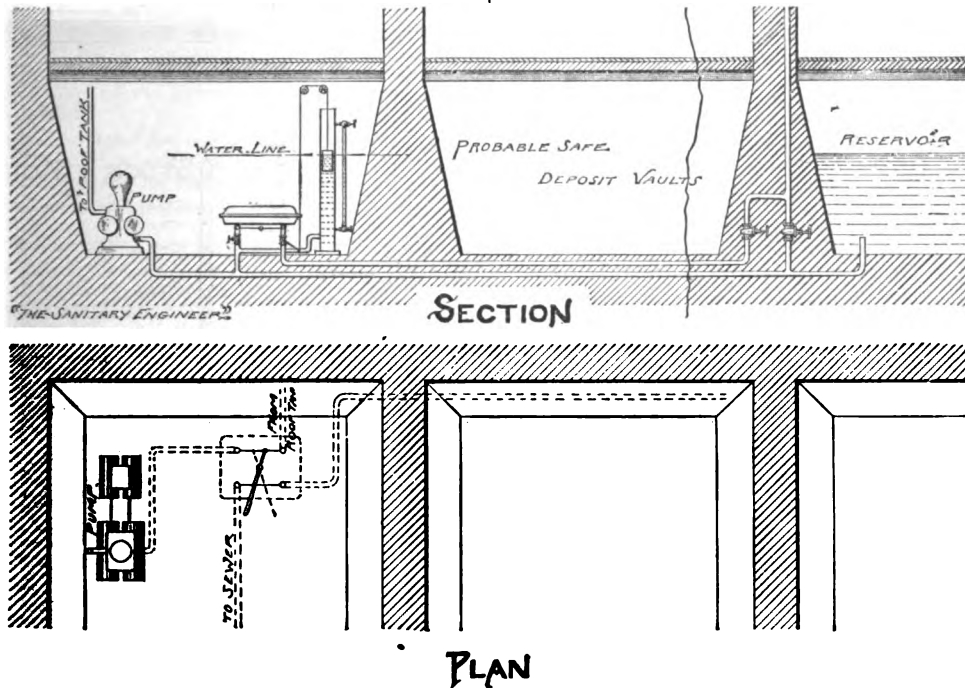


FIGURE 1.

and thence by a larger pump to the tanks in the top of the house. These tanks are wooden, lined with copper, and are four in number, each ten feet long by four feet wide by three feet six inches deep, placed between the ceiling of the eleventh story and the roof and distributed to equalize the pressure on the building, but connected by leveling-pipes so as to make them practically one tank.

(TO BE CONTINUED.)

CIVIL SERVICE EXAMINATIONS FOR PLUMBING INSPECTORS AND ENGINEERS.

AN examination of candidates for plumbing inspectors in Brooklyn was conducted by the Civil Service Commissioners on May 28. Seven candidates appeared. As the examination questions may be of interest, we give those relating to their practical duties:

What is a sanitary trap?

How should a water-closet be properly supplied?

State what the Department of Health requires in regard to sewer-pipe in cellar.

What is usually required under every plumbing fixture where waste is discharged?

What is the object of placing back-air pipes to traps and waste fixtures in buildings?

What is atmospheric pressure?

What is the object of placing a tube on the inside of a kitchen-boiler?

How should a kitchen-boiler be fitted up to prevent collapsing?

There were nine candidates for firemen of stationary engines, and twenty-three for engineers and assistant engineers. The engineers were required to answer the following questions:

What is steam?

What is the difference between high pressure and low pressure?

What is a vacuum?

Explain the object and gain by running an engine at low pressure.

How much less steam do you carry in low pressure than in high pressure, and accomplish the same results?

In what way do you tell the amount of pressure on your boilers?

At what temperature does water boil?

Of what is your boiler made?

What is the difference between wrought-iron and cast-iron?

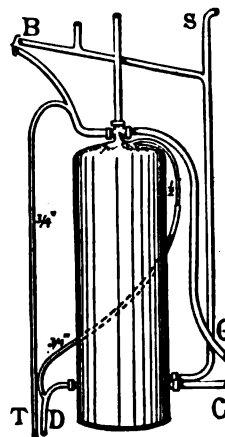
What is the use of the different openings in the boiler?

CURIOUS FITTINGS ABOUT A HOT-WATER BOILER.

DR. VACHER, in the *Health Journal*, of Manchester, Eng., shows the curious example of hot-water fitting, which is reproduced below.

"The figure illustrates," he says, "an instance of defective plumbing in my own district, which was made manifest owing to the frost on March 6. I was informed that a copper cylinder, which had been fixed ten years since, and had

hitherto given no trouble, had suddenly collapsed, the copper being rent in two places. On arriving at the premises I found the cylinder a hopeless wreck, and water still spurting from one of the rents. The cylinder measured $4 \times 1 \frac{1}{2}$ feet, and was fitted as shown. C and C are the circulating-pipes, E the expansion-pipe, S the cold supply, T a hot-water tap for the kitchen, D the draw-off pipe for emptying the cylinder, and which was also used to supply a bath on the kitchen floor, B a hot and cold pipe leading to a bath on an upper floor. I traced the supply-pipe and found that from the point S it was horizontal for thirty-nine feet, out of which thirty feet ran along an external wall, then it ascended along an external wall to a cistern, at the top of the house. It was not surprising that this pipe had frozen. The next thing was to trace the expan-



sion-pipe, which was led up and made to pierce the roof, where the end had become choked with snow and ice. The bath had been in use once or twice since the frost, and as the cylinder cooled the collapse had taken place. All the pipes were $1 \frac{1}{4}$ -inch except those marked. It is not easy to understand the intention of the $\frac{3}{4}$ -inch extending from the pipe D, and continued as a $\frac{1}{2}$ -inch to the top of the cylinder. It appears to have been an afterthought. Prob-

bly the water in the bath supplied from D was not found to be hot enough, as it came from the cold end of the cylinder, and matters were improved in the 'jerry' way indicated. It will be noticed that the return-pipe from the boiler is entered at the top of the cylinder; the approved practice is to enter this as well as the flow at the bottom of the cylinder. It is interesting to note that although this cylinder collapsed it had been fitted with a so-called 'vacuum-valve.' The function of this little apparatus appears to be to give a false sense of security. How often it happens that when its services are really needed it is stiff and does not act."

Correspondence.

DOMESTIC FILTERS.

ALBANY, N. Y., May 22, 1886.

SIR: I enclose circular of a filter which seems to be designed on correct and sensible principles, but it is constructed, as I believe most such contrivances are, of galvanized iron, with soldered joints, the solder being composed of tin and lead, so the maker says. Do you think there is danger of metallic poisoning in using such an apparatus? Do you know of any earthenware filter which is more than a mere strainer? The favor of any information will greatly oblige a regular reader and great admirer and advocate of your unique and most excellent journal.

Respectfully yours,

G. M. T.

[The filter alluded to seems to us to be only one among many score, and not to be essentially novel either in material or arrangement. We regard it as a defect that the filtered water stands in contact with zinc. This is quite unnecessary, for there are a number of filters in the market which are made of earthenware. We think all that can reasonably be expected of a domestic filter is that it should be efficient as "a mere strainer," although there are filters which claim to be more. We would refer the inquirer to recent articles in *THE SANITARY ENGINEER*—namely, to Vol. XI., pp. 188 and 482, and Vol. XII., p. 188. This matter is also exhaustively treated in "Water-Supply, Considered Mainly from a Chemical and Sanitary Standpoint," by Prof. William Ripley Nichols.]

WROUGHT OR CAST IRON LOW-PRESSURE BOILERS.

—, May 26, 1886.

SIR: (1) Which is better for house-warming, a wrought or cast iron boiler (low-pressure)? (2) Is either likely to explode by careless handling? Yours, H., Architect.

[These questions are frequently asked us, and, as they are ones that, if answered categorically, might do an injustice to some deservedly good apparatus, whether wrought or cast iron, or a combination of both, we have to reply by explaining, (1) that if there is no difference between two boilers other than that one is wrought and the other cast iron there will be no difference in their evaporating power, and, hence, they will be equal in this respect. The fact of the conducting power of iron in one state being a trifle greater than of iron in another state is sometimes taken advantage of by makers to claim greater evaporative power for the one than the other, they citing the fact of the transmission of the heat. This is misleading and has nothing to do with the power of the boiler to evaporate water, for the simple reason that the transmission of heat through comparatively thin walls of metal is so very much in excess of the power of the water to absorb the heat, that any slight difference in conducting power is for naught, and it is only on the ease and rapidity of the water to circulate against the inner surface of a boiler that a boiler's efficiency depends. This is why a copper boiler will evaporate no more water than an iron one, all other things being the same.

Many cast-iron boilers are made in small sections so arranged in connection with each other that the circulation is retarded, and many of them have no visible means whereby a return of the water forced up by the steam or by circulation can take place. Others, again, are well arranged in this respect, and their very form favors and induces a rapid circulation with easy return to the lower part of the boiler.

Wrought-iron boilers have the same objections, it being a mystery in some of them how the circulation goes on. Then, again, there are two classes of wrought-iron boilers, known as "fire-tube" and "water-tube." Some of the latter are designed with a special view to stimulating the circulation with short circuits, while some of them are so long and small in their coils that they will burn, the resistance

to circulation being so great that the water is forced out of them (both ways) by the generation of steam. The fire-tube boiler, having a larger quantity of water, is not so likely to burn on this account, but many of the small upright ones of complex form do.

(2) In replying to the second question, we will say all boilers are likely to explode by careless handling, and that it is difficult to draw comparisons between wrought-iron and cast-iron, as the conditions (materials alone excepted) cannot remain the same. For instance, wrought shells and cast shells, or very large cast sections, are alike in bulk of water and steam entrained, and should they explode, will do about equal damage, whereas, if they are both water-tube (wrought or cast) they will do about equal damage if they break. Of course, cast tubes or sections are more likely to break than wrought ones in a fire, but, as a general thing, the sections are small in cast boilers.]

CALCULATING THE HEAT UNITS IN AIR.

NEW YORK, May 26, 1886.

SIR: Will you, in an early issue of THE SANITARY ENGINEER, give a steam-fitter a simple and comprehensive method of figuring the heat units in air?

To make it plainer, I am passing 120 cubic feet of air per minute through an indirect radiator, and the air is entering at zero, and passing into the room to be warmed at 100° Fah. What, therefore, is the exact number of units of heat added to the air? I wish to be able to figure this to see how much of the heat of the water condensed in the radiator is made apparent in the air; or, in other words, I want to find the loss of heat.

Yours truly, "STEAM-FITTER."

[You omit one very important point in asking for the information, and that is, whether you measured the velocity of your air before or after passing the radiator. We will assume, therefore, that you measured it after passing the radiator—say in the duct leading to the room. According to Regnault, the specific heat of air is .2379 when the specific heat of water is 1. This means, plainly, that one pound of water will absorb somewhat more than four times the heat that a pound of air will, for an equal apparent rise of temperature; or, to put it another way, the cooling of one pound of water one degree will warm 4.2 pounds of air just one degree. This is the first factor to be determined and remembered in this question, and the second is the number of cubic feet of air at 32° Fah. that will weigh say one pound. This is taken at 12.387 cubic feet, and as 4.2 times as much heat will come from the water, it stands to reason we will warm 4.2 times one pound of air—or, in other words, 52 cubic feet of air—as many degrees as we will cool one pound of water. As the warming of one pound of water is the equivalent of a unit of heat, we have then 52 cubic feet of air warmed one degree as the equivalent of the heat unit also. If we commit this to memory it is not so important in this matter to remember the earlier components.

It next becomes necessary to reduce the volume of air at 100° Fah. to its volume at 32° Fah. To do this for all practical purposes, we must find what the volume will be at 100° when it is unity at 32°. The rule for this is to divide the difference between 32° and 100° by 490, and add 1 to it, when we will have the bulk at 100. Thus, $\frac{100 - 32}{490} \times 1 = 1.139$. By dividing the answer thus

obtained into the air passed in a minute (160 cubic feet) we have $\frac{160}{1.139} = 140.47$ cubic feet as the bulk of air passed,

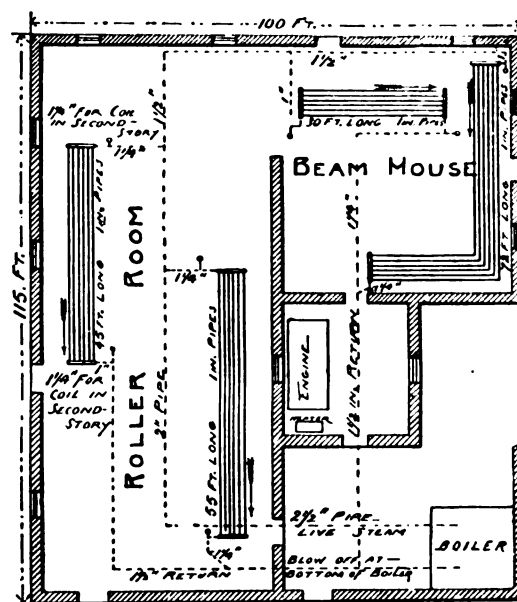
supposing it to be 32° Fah., instead of 160 cubic feet at 100°. As it is best for obvious reasons to consider these questions for an hour of time instead of for one minute, we will multiply by 60 and then have 7,228.2 as the cubic feet of air passing into the room in that time. As this air was warmed from zero to 100°, we may multiply it by 100, and we will have the number of cubic feet of air at 32° that would be warmed 1° Fah. = 722,820. If we then divide this by the 52 we found in the first place, we have the number of heat units added to the air of the room for one hour of time; thus $\frac{722,820}{52} = 13,900$ heat units. The answer

thus obtained divided by 966 (the units of heat in a pound of steam at atmosphere, or say very low pressure steam) will give the amount of steam in pounds weight made available, the difference between it and the actual amount of steam condensed being the loss.]

THE DESIRABILITY OF MAKING A GRAVITY APPARATUS, WHEN THE COILS ARE ONLY FOURTEEN INCHES ABOVE THE WATER-LINE.

PHILADELPHIA, May 31, 1886.

SIR: Seeing in your valuable paper answers to correspondents about steam-heating, I take this opportunity to ask you a few questions. Enclosed you will find plans of a job (Figs. 1 and 2) of return steam-heating, which I have to give an estimate on, and also to guarantee it, but on account of there being so little difference of level between the steam-coils and the water-line of the boiler, I am afraid to do so without having better reasons and authority than my own. The boiler, as you will see, is situated in the south-west corner of the building, and my plan is to start from it with 2½-inch main (which you will see on the side elevation of the boiler-room, Fig. 3), and then to rise to the ceiling of the roller-room and continue, as shown on ground plan, along near the ceiling, connecting with two overhead coils and one other coil in second story, which lies upon the floor, and then continuing onward and connecting with two coils in beam-house. This is the whole of the live-steam pipe. The return is then to pass from the two coils in the roller-room, and the one in drying-room in second story through 1½-inch pipe, and will go into boiler at the blow-off pipe, having a check-valve on it. The return from the two coils in beam-house passes through the engine-room and goes into the same blow-off with a check-valve on it, independent of the other return. Now, at the lowest point in the coils there is only 14 inches between the coils and the water-line of the boiler. Would this work satisfactorily, heating with 65 pounds of steam, or would I gain anything by going



FIRST STORY PLAN

FIG. 1.

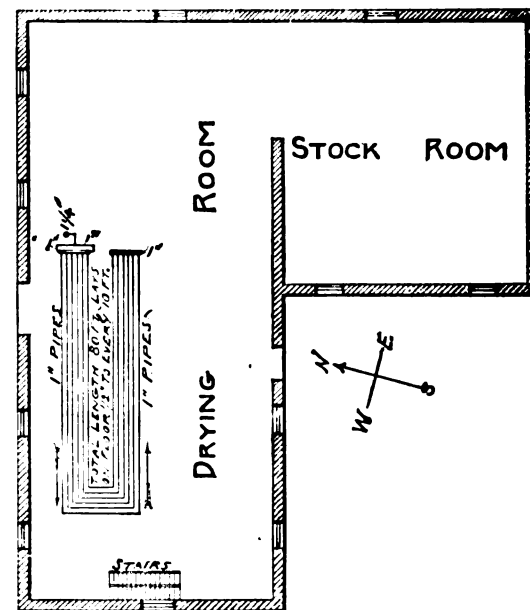
through roof of boiler-room 10 feet and crossing over 15 feet through the open air into the second story or drying-room, as you will see by the section of boiler-room, and then continuing through drying-room and stock-room, and dropping down and supplying the various coils throughout the building from above? I have done jobs before with four feet difference under the same conditions, and they worked satisfactorily, but having so little fall I am rather timid in regard to it. I also wish to know, will one cubic foot of still water cool more heat units than 10 square feet of plastered surface, or what ratio do they bear to one another? By answering the above questions you will greatly oblige and relieve. The pipe wherever exposed to the air will be covered; also, for convenience, the springs of the coil are omitted. A CONSTANT READER.

[There is nothing more to be gained by carrying the steam-pipe through the roof of the boiler-house and entering the drying-room through the side than would be obtained by running under the boiler-room roof and going up through the drying-room floor as you show (pipe a). Of course, it is better to carry the main steam-pipe up and on the ceiling of the drying-room (second story) than on the ceiling of the roller-room (first story), as then there will be less likelihood of water "backing" up from the returns to the mains through a relief-pipe, but it is just as well to pass in first and then up.

We believe that, with a pressure of 65 pounds, with the amount of surface you show and the size of pipes you intend to use, the apparatus might be made to work with the difference of only 14 inches between the water-line and the lowest part of the coils, and that if we had only to demonstrate that it could be made to work, by care and a thorough knowledge of how to manipulate the

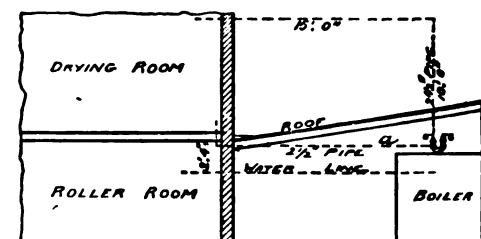
valves, etc., we would do it; but for practical purposes, in the hands of ordinary persons, we would devise some positive method of getting the water back to the boiler.

If you designed it for a gravity apparatus it would work only at middling high pressures, or at the extremely low pressure of one-half pound above atmosphere, or at a pressure of one, two, or three pounds, or presumably any pressure below 20 pounds, the apparatus (lowest coils) would fill with water. You do not say whether the return-pipe is to be on the floor or overhead in the roller-room. If the latter, the work would be very noisy, as the nearly horizontal pipes would be probably just about at the water-line, or a little above it—a circumstance which insures "pounding" in any work. Our advice in this instance is to use either a "return-trap" or a pump with or without a receiving-tank. Of course, if you do not use a receiving-tank the pump must be small (just large enough for this work), and must be kept running all the time, or the returns will fill up; whereas, with a tank, any reasonable sized



SECOND STORY PLAN

FIG. 2.



SECTION

FIG. 3.

pump will do, as it can be used to pump the tank empty when it can remain idle until the tank fills again. A small pump, with a pump-governor, presumably, is a better arrangement than a large receiving-tank, as by the use of the latter the water-line in the boiler is maintained at a more constant level. The "return-trap" will also maintain a nearly constant level in the boiler. We do not quite understand your question about "still water, etc.," but to warm one cubic foot of water from 40° Fah. to 212° Fah. will require the condensation of 11 pounds weight of steam, not considering loss by condensation in pipes, etc.; in other words, for every cubic foot of water you wish to boil in a tank or kettle you must evaporate at least 11 pounds of water in your boiler in the same time.

The heat-units required to boil a cubic foot of water are about 10,750, varying with the initial temperature of the water, and the units of heat lost through 10 square feet of the walls of a building will be from something like 150 to 500 per hour, depending on the state of the weather.]

A PLUMBER, while repairing sewer-pipes in the cellar of the Washingtonian Home in Chicago, left some gasoline-cans used by him uncared for, and suddenly an explosion occurred which startled the neighborhood, which fortunately did no serious damage. The goods on the shelves and counters of a grocery store, which is over the cellar, were thrown from their places, and the plate-glass in the front window was hurled outward to the sidewalk.

REPORT OF THE CHAMBER OF COMMERCE COMMITTEE ON THE IMPORTATION AND DISINFECTION OF RAGS.

We print below the substance of a report made by the Special Committee of the Chamber of Commerce of the State of New York, on the rules enforced at this port for the disinfection of rags. This report was adopted with an amendment to the third resolution, placing the regulations relating to the disinfection of rags and other merchandise under the sole control of the United States Government. The amendment is indicated by the *italicized* words in the resolution as here printed.

The report reciting the circular of the Treasury Department, dated June 10, 1885, which placed the quarantining of rags under the jurisdiction of the health officers at the port of entry, proceeds:

At the request of your committee, the Health Officer of the Port of New York promptly transmitted a statement of the regulations in force at this port. They say:

"A certificate of an inspector appointed by the Secretary of the Treasury for the disinfection of rags, and authenticated by the United States Consul, that the rags have been disinfected by one of the following processes, is required with each invoice:

"1. Boiling in water for not less than 30 minutes and dried before baling, or treated with superheated steam under 25 pounds pressure for not less than 8 minutes, and in such manner as to be heated to or above 230° Fah. in every part.

"2. Exposure to dry heat to 230° Fah., maintained for three hours.

"3. Subjection to sulphur dioxide, introduced in a vacuum of at least 25 inches, continued until a pressure of at least 25 pounds is produced, and an exposure to these conditions at least 20 minutes.

"The following regulation for the disinfection of rags is one of several processes directed by the Treasury Department of the United States Government, in a circular dated December 22, 1884:

"Subjection to the action of confined sulphurous acid gas for six hours, burning two pounds of roll brimstone in each 1,000 cubic feet of space, with the rags well scattered upon racks.

"Disinfected rags, or those accompanied by certificates of disinfection, properly authenticated, are given pratique without delay.

"Rags from infected ports, or gathered in infected countries, are subjected to preliminary disinfection at Quarantine, for the benefit of those portions of the bale (the wrappings) that have been exposed to the filth of the streets and wharves of infected ports. The detention for this purpose is usually an hour, more or less, according to the facilities afforded for disinfecting by the stowage of the cargo.

"Vessels with cargoes of undisinfected rags and general merchandise are given 'permit' to discharge cargo, 'except rags,' or a 'permit to discharge rags for disinfection.'

"Vessels with invoices of rags accompanied by properly authenticated certificates of disinfection are given 'permit' at Quarantine, 'for landing and distribution of the rags.'

"WM. M. SMITH,
"Health Officer, Port of New York."

If these regulations were applicable only to rags gathered in infected countries and exported to this country, either directly from infected ports, or indirectly, *via* or from uninfected ports or countries, it is believed that they would meet with general acceptance from those engaged in the trade; and, further, that even no objection would be made by importers if the landing of such rags in this country should be absolutely prohibited during the prevalence of cholera or other supposed infectious or contagious disease, and for a reasonable time after its disappearance. This latter course, as appears from copies of official orders, was adopted in 1884-85 by England, Belgium, Holland, Germany, and Austria, when cholera was epidemic in certain parts of France, Italy, Spain, and other countries bordering on the Mediterranean, and, if cholera ever has been or can be conveyed in rags, this course would surely seem as effective as any other to prevent it.

Your committee is informed that at some ports of shipment no facilities have been provided for disinfecting by either of the designated processes, and at some there are no inspectors appointed by the Secretary of the Treasury to certify to the disinfection, as required by the regulation. In such cases the declaration of the shipper that the rags were not gathered in any infected port, district, or country, and the certificate of the local health authorities or other officials, that the country was free from infectious or contagious diseases, authenticated by the United States Consul, have not been sufficient to exempt the rags from disinfection by a costly process on arrival at New York. This has occasioned much dissatisfaction.

In December, 1884, a patent was obtained for disinfecting bales of rags by means of superheated steam injected into the bale through perforated screw-tubes, and, since January, 1885, this has been the only process, and, apparently, the only available one, used for that purpose in this port. The usual charge for disinfecting is \$5 per ton (the ton being considered equal, on an average, to about three bales), and \$1.20 per ton for lighterage to and from the place of disinfection. On a cargo of 1,000 tons this will amount to \$6,200, and is equivalent to from ten

to twenty per cent. of the value of the rags. This heavy tax caused great dissatisfaction among importers and paper-makers, and resulted in diverting about one-fourth of the entire importation destined for New York, in 1885, to other ports where such an onerous regulation and requirement did not exist. Under permits from the Treasury Department, 19,295 bales were reshipped for entry to Portland, 2,500 to New London, 4,900 to Philadelphia, and 12,709 to Perth Amboy, from whence they were removed to Communipaw, opposite this city. From these points they have been distributed to paper mills throughout the country without being disinfected, and without detriment to the public health.

The regulation for disinfecting by superheated steam requires that the bale shall be subjected to it "for not less than eight minutes, and in such manner as to be heated to or above 230° Fah. in every part." It is alleged by importers that two requirements are not fulfilled, and, therefore, that the process, as hitherto applied, has been practically worthless. Your committee inclines to the opinion that this allegation is not entirely unfounded; that it does not, however, affect the merit of the process as a germicide, but rather indicates that it has not been carefully, faithfully, and sufficiently applied. It is also alleged that the rags are injured by moisture caused by condensation of the steam, but the committee has not pushed inquiries on that point.

Regulations which subject rags gathered in healthy countries and ports to disinfecting processes, on the supposition that they may be a medium for conveying cholera germs, do not find support in a general consensus of opinion, nor in facts of experience.

The protection of the public health by the adoption and enforcement of proper maritime quarantine regulations to prevent, if possible, the introduction from foreign countries of infectious or contagious diseases, is, and should be, paramount to all merely commercial considerations; but, at the same time, no unnecessary burdens, restrictions, or obstructions should be imposed on commerce, trade, and manufactures, and especially if they are confined to only one or two ports, instead of being general to all, for in that case trade may be diverted from one to another without accomplishing the end desired—namely, protection of the public health; for it would seem futile to expect to shut out a possible danger by closing the main door of the house and leaving the windows open.

This makes it highly important that quarantine sanitary regulations, so far as they are deemed necessary or expedient, should be alike at all ports of entry; and if this is desirable, uniformity cannot be acquired through voluntary harmonious action of the health authorities of the several States having seaports, then, as Congress has power "to regulate foreign commerce," and "to provide for the general welfare," and inasmuch as quarantine regulations are connected with foreign commerce and the administration of our custom houses, and as protection of the public health is of importance, not only to particular localities, but is of equal and general concernment to all inhabitants of the country, therefore, in the opinion of your committee, if existing laws do not, as stated in the Treasury circular of June 10, 1885, give the National Government sufficient authority to fully control and regulate, as may be expedient from time to time, the whole subject of quarantine, Congress should be asked to enact such laws as may be necessary for that purpose.

Your committee cannot refrain from also calling attention to the fact that, according to the census of 1880, the quantity of rags used at the paper mills in the United States was 187,917 tons, and that of this quantity more than one-half were domestic rags—*i. e.*, rags gathered in our own country—and under circumstances and conditions not unlike those attending the gathering of old rags in foreign countries. Almost the only contagious disease that has ever appeared at paper mills in this country, and been attributed to the handling of old rags, is small-pox, and the cases of this, fortunately, are quite rare, and, in a majority of instances, are said to be traceable to domestic rags. None of our domestic rags are subjected to disinfection, or to any quarantine regulations whatever. A requirement that all persons engaged in paper mills should be vaccinated would probably be as sure a protection against small-pox as the disinfection of rags.

The fear of danger from imported rags as being a medium for conveying contagion, and especially in relation to cholera, is probably far greater than the facts of experience justifies; but so long as such fear exists in the public mind, and in deference to it, your committee believes it expedient that such reasonable restrictions should be imposed upon their importation as will abate that fear, and yet not be too oppressive to the large industrial interests connected with that branch of commerce and the manufacture of paper.

This Chamber, in a resolution adopted June 4, 1885, has expressed its opinion that invoices of rags accompanied by a certificate of the United States Consul that the rags were all gathered in a country free from contagious or infectious diseases, did not require to be disinfected; and in relation to all other rags, that the proper disinfection at the place of shipment will cause the removal of all germs of disease and unhealthy consequences from the importation of rags into this country, and that the Chamber would recommend such action on the part of our Government as will require such disinfection at the port of shipment of every invoice of rags, and that the same shall be accompanied by the certificate of the United States Consul setting forth the fact.

As has been seen, on June 10, 1885, the Government

revoked all its circulars and relegated the whole subject to the health officers of the several ports of importation.

In view of the present condition of the matter and the difficulties and discontents that have attended it, your Committee, after hearing and reading much testimony, upon mature reflection has decided to present for consideration and action the following resolution:

Resolved, That it is the opinion of this Chamber—

I. That invoices of rags accompanied by a certificate of the United States Consul that they were all gathered in a country which at that time was, and for at least six months immediately preceding had been, free from cholera, or other contagious or infectious epidemic diseases, should not be required to be disinfected either before shipment or on arrival. In the absence of such certificate, rags coming from a port or country claimed to be free from such diseases should be disinfected on arrival.

II. That rags gathered in any port or country where such diseases then were, or had been prevalent at any time within six months immediately preceding the shipment thereof, and whether such rags are exported direct, or *via* any other port or country, and whether landed or stored therein, or transhipped overside to another vessel for re-export, should be prohibited from being landed in the United States so long as any prohibitory order, published by the Government or health officers, remains in force; nor when the order is rescinded should such rags be landed until disinfected on arrival.

III. That quarantine regulations in relation to rags or other merchandise or disinfection thereof, should be uniform at all ports of entry in the United States, and *should be under the sole control and management of the United States Government.*

A resolution was also adopted to the effect that the action of the Chamber was not intended as a personal reflection on Quarantine Officer Smith, who doubtless had exercised his discretion conscientiously.

Novelties.

Under this heading we propose to describe and illustrate appliances of probable interest to our several classes of readers. The selection will be made without reference to the wishes of agents or patentees, being governed solely by considerations of novelty, ingenuity, and probable interest to readers, and especially the fact that they have not been elsewhere described. As a rule we shall make no comments, and it is to be distinctly understood that a notice does not imply approval. No charge will be made for these notices, and any offer of pay for their insertion will insure their omission. We shall be glad to have our attention called to novelties suitable for this section.

APPARATUS FOR DISINFECTING BY DRY HEAT OR STEAM.

We give herewith illustrations showing an apparatus designed and patented by Oscar Schimmel, of Chemnitz, in Saxony, for the purpose of disinfecting clothing, textile fabrics, bedding, parcels, or mail-matter by dry heat, and, when desirable, by steam admitted directly into the chamber.

The apparatus, in brief, consists of a jacketed disinfecting-chamber and an interior frame or cage in which the articles to be disinfected are placed and exposed to the action of hot air or steam, or both, and that is supplied thereto by a set of heating-pipes and a live-steam pipe, the disinfecting apparatus being tightly closed and provided with a valved air-induction pipe and a valved outlet.

In the drawings Fig. 1 represents a vertical longitudinal section of the apparatus; Fig. 2 is a horizontal section of the same, and Figs. 3 and 4 are respectively a vertical longitudinal section and an end elevation of another modification of the apparatus.

The disinfecting-chamber is formed of a double-walled casing, preferably of iron, the walls of which are filled with a suitable non-conductor of heat. It is heated by a set of steam-pipes, *k k*, that are supported by rollers *g* on bottom rails, as shown, which are located at the lower part of the casing. The perforated steam-pipe *l* supplies live steam to the interior of the chamber. A movable perforated bottom is suspended by hangers from a horizontal frame, which form a cage, with cross-bars and hooks for the articles to be disinfected. The cage moves by means of rollers on top of the rails of the chamber. The front wall of the disinfecting-chamber is provided with two doors, one below the other, of which the upper door, *a*⁵, serves for removing the cage from the disinfecting-chamber, while the other door serves for removing the system of heating-pipes, in case the entire apparatus is to be moved. At the lower part of the side walls of the chamber are arranged valved openings *o o* for the entrance of air when it is necessary to admit the same.

The double-walled casing is so constructed that the walls can be taken apart and put together again in order to facilitate the removal of the apparatus from place to place.

The steam-pipes are provided with a number of annular projecting ribs, by which a large heating-surface is

obtained for heating the air. The water of condensation is conducted from the heating-pipes by a pipe, *c*, to a receiver or trap. The bottom of the chamber is provided with a pipe for draining off the water of condensation that may form on the walls when direct steam is used. A valve-casing, *o*, at the lower part of the chamber is provided with an adjustable valve for admitting air to the interior. A perforated coil above the heating-pipes, *k k*, is provided and connected with the steam-supply pipe and supplies live steam to the disinfecting-chamber. A thermometer is located in the outlet-pipe to indicate the temperature at the interior of the apparatus. The steam-pipes *k k* heat the air at the interior of the apparatus, while the live steam admitted through the perforated coil *b* acts with the hot air on the clothes or other articles in the chamber.

methods as are satisfactory, and shall be approved by the State Board of Health.

SEC. 6. This act shall take effect on and after the 1st day of January, in the year of our Lord 1887.

Reviews of Books and Pamphlets.

THIRD ANNUAL REPORT OF THE SUPERINTENDENT OF HEALTH OF THE CITY OF PROVIDENCE, for the year ending December 31, 1885. 61 pp., 8vo.

In this report the Superintendent of Health, Dr. C. V. Chapin, states that the health of the city has been unusually good during the year, the number of deaths—viz., 2,161—

NINTH REPORT OF THE STATE BOARD OF HEALTH OF WISCONSIN, 1885. 308 pp., 8vo. Madison, Wis., 1886.

In presenting his report, Dr. J. T. Reeve, the Secretary of the board, remarks that he has so much correspondence from local boards of health, etc., relative to the sanitary condition of various localities which he thinks proper to print, that there is no room for special papers or essays, and accordingly we find that over 200 pages of the volume are occupied with local reports and correspondence.

While the interest in these reports is chiefly local, and many of them indicate very little interest in sanitation on the part of the local authorities, they form a record which will be of very considerable historical interest and value twenty-five or fifty years hence, and they show, as Dr. Reeve remarks, that the influence of the State Board is extending, and that the intelligent interest in sanitation is increasing throughout the State. The following extract shows a state of things which exists in many other States besides Wisconsin:

"A very serious drawback to the usefulness of health boards in many instances is formed by the parsimony of the boards themselves in fixing the compensation of their executive officer. A frequent consequence of this ill-judged parsimony is that some man wholly incompetent for the post, whose only qualification in fact is that he is willing to accept it for the sake of the five or ten dollars per annum grudgingly doled out to him, is appointed to do the work of investigating 'all the circumstances attendant upon the appearance of dangerous contagious disease, and to take measures for the prevention, control, and suppression' of Asiatic cholera, diphtheria, scarlet fever, small-pox, and kindred maladies.

"It may easily be the case that he has never seen an instance of any one of these diseases, that he cannot distinguish the eruption of measles from that of small-pox, even when both are fully developed, and that he knows nothing of the precautions proper to be adopted should any contagious disorder appear; indeed he trusts to luck or to the chances that, as no such disease has made its appearance in the town as yet, none will appear, at any rate during his term of office. He makes report to the State Board of Health that 'there ain't no danger hear of enny contagus disease fur the peepel dose there level best to prevent sutch;' while with regard to sanitary conditions he 'ain't lookt into them very mutch but there hant bin no contages diseas in this part of the Country as he has hurd off and plese excuse delay it was on account of post-master,' and thus, if circumstances are favorable, he gets through his term of office, and thinks that he has earned his stipend.

"Perhaps, however, everything does not work as smoothly as he had hoped and trusted. It may be that some stranger passing through the place, or some member of a newly-arrived family of immigrants from the old country, coming with bed and baggage, is taken sick. Sympathizing neighbors, relatives, friends, and curiosity-seekers visit the patient before it is suspected that there is any danger in so doing, or regardless of such danger, or even recklessly indifferent to all considerations of duty to others. The seeds of some contagious disease—small pox it may be—are soon broadcast throughout the community. The health officer has not prepared himself by previous forethought for any such emergency; he has no definite idea of what he should do, and, if a non-professional man, he has perhaps an added fear of personal danger. He has 'trusted to luck' so far, and he now hesitates, vacillates, and neglects the clear, prompt, and positive action which is within his power and which it is his duty to take, such action as alone can insure the benefits of preventive medicine. The town board has saved a few dollars in the salary of such a man, but before the disease is suppressed it will have abundant opportunity for seeing that this 'prudent and economical management' has cost the taxpayers a hundred-fold the amount thus saved in money, and a thousand-fold its value in anxiety, and probably in life."

NOTES.

A SUIT has been begun in a Gravesend, L. I., court to recover \$75 damages from the Kings County Water Company, because of the collapsing of the kitchen-boiler, due, it is alleged, to the stoppage of the water-supply.

THE Baltimore Health Department and the police have begun a house-to-house inspection.

THE Montreal Board of Health has directed the Sanitary Police to report all manufacturing establishments whose operations cause nuisances, and to procure evidence for the conviction of the proprietors. The Health Department hopes to be able in this way to either abolish from the city altogether, the glue, tallow, and soap factories, which have been so frequently complained of, or to secure a stoppage of the particular operations which are the source of the complained of odors. The class of establishments which the Board of Health will first endeavor to clear the city of will be the raw-hides warehouses. Evidence has been secured against some of these establishments, and actions will be entered against them.

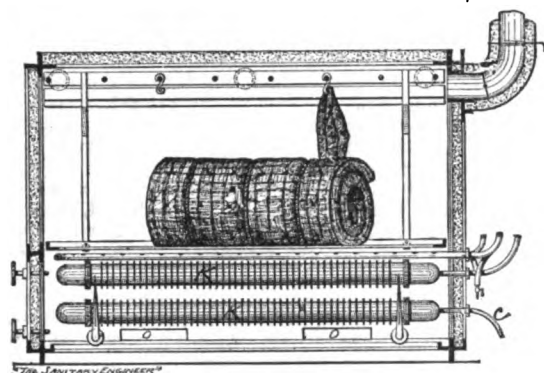


FIG. 1

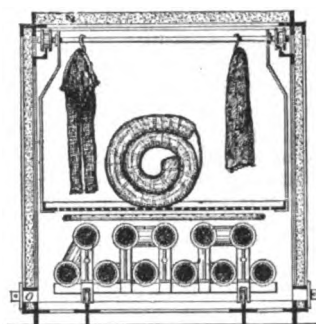


FIG. 3

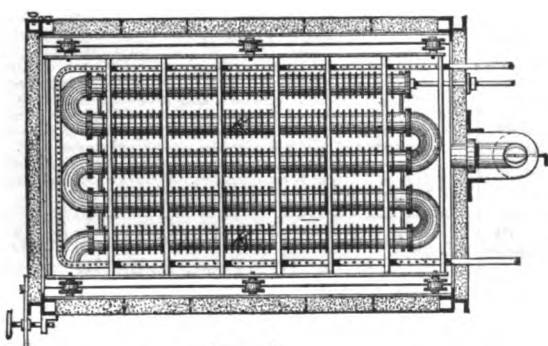


FIG. 2

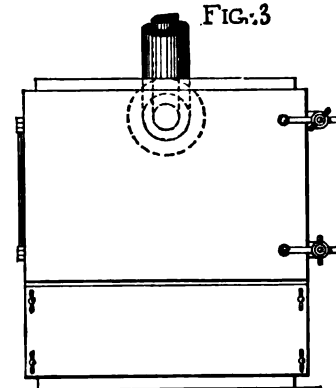


FIG. 4

SCHIMMEL DISINFECTING CHAMBER.

LEGISLATION AGAINST ARSENICAL PAPERS.

THE Boston Herald says the Committee on Public Health of the Massachusetts Legislature will report the bill given below. This is all right as far as it goes, but it should include wearing-apparel as well as wall-paper and toys.

SECTION 1. Whoever by himself, or by his servant or agent, or as the servant or agent of any other person, manufactures, sells, exchanges or delivers, or has in his custody or possession with intent to sell or exchange, or exposes or offers for sale or exchange, any paper or article composed wholly or in part of paper in the manufacture or coloring of which arsenic in any form is used, or which contain arsenic, shall be punished by a fine of not less than \$50 nor more than \$100; provided, however, that this section shall not apply to paper or articles composed wholly or in part of paper containing not more than at the rate of one-sixth of a grain of arsenic to each superficial square yard.

SEC. 2. Whoever, by himself or by his servant or agent, or as the servant or agent of any other person, manufactures, sells, exchanges or delivers, or has in his custody or possession with intent to sell or exchange, or exposes or offers for sale or exchange, any children's toys, coated wholly or in part with paint containing arsenic, shall be punished by a fine of not less than \$50 nor more than \$100.

SEC. 3. The State Board of Health shall make the necessary investigations and inquiries as to the existence of arsenic in paper, or the articles named in Sections 1 and 2 of this act, and may appoint inspectors and chemists for that purpose, and may annually expend an amount not exceeding \$1,000 to carry out the provisions of this act.

SEC. 4. Every person offering or exposing for sale or exchange any paper or article made wholly or in part of paper, shall furnish to any inspector, chemist, or other agent or officer employed by the State Board of Health, who shall apply to him for the purpose and shall tender to him the value of the same, a sample sufficient for the purpose of analyzing any such paper or article. Whoever violates the provisions of this section shall be punished as provided in Section 1 of this act.

SEC. 5. The analysis of such paper or articles named in Sections 1 and 2 shall be made by such processes and

being 69 less than the number in the preceding year, and giving a mortality-rate of 18.31 per thousand of population.

The physicians of Providence are required by law to report cases of contagious disease to the Superintendent of Health, and it is stated that the law is pretty generally complied with. During the year 1885 there were reported 383 cases of scarlet fever, causing 38 deaths; 146 cases of diphtheria, causing 37 deaths; 87 cases of typhoid fever, causing 14 deaths, and 126 cases of measles, causing 8 deaths. A large amount of vaccination was performed in the city by a house-to-house visitation, and in referring to this Dr. Chapin takes occasion to mention the fact that much the larger part of the vaccinations in Providence have been made with virus which has been passing from arm to arm for many generations, being derived from a stock brought to this country in 1801, and that this virus shows no trace of loss of protective power. He says: "The humanized virus is used because, in the experience of this department, it causes less soreness and irritation, and is less liable to give rise to disagreeable sequelae than any bovine virus with which I am acquainted. Moreover, it is much more sure in its action than any bovine virus, at least more certain than the bovine virus which I have been able to purchase."

The condition of Providence as regards sewerage and water-supply is not very satisfactory. There are a large number of houses on sewered streets which are not yet connected with the sewers; there is a large population where there are no sewers and where cesspools and privy-vaults abound, and the outlet for the sewers which have been constructed does not give satisfactory results. There are some dangers of pollution to the general water-supply, but these are being removed. There are, however, 1,424 wells still in use in the city, and the water in some of these is dangerously contaminated.

The report closes with the following statistical data: The city of Providence has a population of 118,070 contained in 16,274 dwellings, on an area of 10,016 acres. The assessed valuation of its real estate is \$92,887,400, of personal estate \$31,314,600, total \$124,202,000. It has 152 miles of streets, of which 19 miles are paved, and 88 miles curbed but not paved. It has 189.3 miles of water-pipes, and 53 miles of sewers, 10,136 cesspools, 11,981 privy-vaults, and 8,262 water-closets.

EXAMINATION FOR PLUMBING INSPECTORS IN PHILADELPHIA.

THE committee on the examination of applicants for the positions of chief and subordinate inspectors of plumbing and drainage have reported to the Board of Health that 22 persons applied for examination, and of them 12 passed satisfactorily. From the number passing the board chose the chief and six subordinates. George S. Hughes, who passed with the highest grade, was made chief inspector. He is a practical plumber, who has served a full term of apprenticeship, and has worked as a journeyman for a number of years. The other six inspectors are John Calhoun, William H. Smith, Lawrence Shuster, William McFarland, William Wilde, and J. K. Hamilton. The board has recommended to councils that it make the salary of the chief inspector \$1,500 per annum, and of the six subordinate inspectors \$1,200 each yearly.

REGULATING THE USE OF WATER FOR IRRIGATION.

A CONVENTION on Irrigation has recently been held in San Francisco, which has prepared the following amendment to the State Constitution, relating to the use of water-sources in the State:

SECTION 1. The use of all water now appropriated or that may hereafter be appropriated for irrigation, sale, rental, or distribution, is hereby declared to be a public use and subject to the regulation and control of the State in a manner to be prescribed by law, provided, that the rates of compensation to be collected by any person, company, corporation or irrigation district in this State for the use of water supplied to any city and county, or city, town, or irrigation district, or the inhabitants thereof, shall be fixed every three years by the Supervisors, or city and county, or city and town Council, or other governing body of such city and county, or city, or town, or irrigation district, and shall continue in force for three years, and until the rates are established; but in establishing such rates they shall take into consideration the cost of construction and maintenance of the works by which the water is supplied, and the rates so established shall be such as will yield to the person, company, or corporation so supplying water a net return of at least 7 per cent. per annum upon the amount invested in the construction and maintenance of such works. Such rates shall be fixed in the month of February, and take effect on the first day of July thereafter. Any board or body failing to fix the water rates when necessary within such time shall be subject to peremptory process to compel action at the suit of any party interested, and shall be liable to such further process and penalties as the Legislature may prescribe. Any person, company, or corporation collecting water rates otherwise than as so established shall forfeit the franchise of such person, company, or corporation to the city and county, or city or irrigation district from which the same are collected, for the public use.

Patents.

No. 342,267 is a patent for a muffler attachment for safety-valves, issued to George W. Richardson, of Medford, Mass., and consists of a series of superposed cups surrounding the spring-inclosing casing, and forming a continuous side-wall with intermediate inclosed and communicating chambers, through which the escaping steam is directed to the atmosphere.

No. 342,274 is a patent for a steam-excavating process of sinking wells, granted to John A. Wagner, of Middletown, O., and consists of the process of excavating or sinking wells, shafts, adits, or other perforations in the earth's crust, which consists in directing a jet of steam against the earth to be removed, and gradually inserting into the excavation thus formed the pipe or tube through which the steam is conveyed, until the desired depth is reached.

No. 342,297 is a patent for a centrifugal or rotary pump, issued to John Gwynne, of London, Eng. Patented in England. A centrifugal or rotary pump provided with a case swiveled at the centre, whereby the suction and delivery pipes are brought to any required angle without the removal of bolts.

No. 342,305 is a patent for a pipe-coupling, issued to Joshua Nuttall, of Pittsburg, Pa., assignor of one-half to Joshua Rhodes, same place, and consists of a coupling-sleeve having

a central inwardly-projecting threaded offset with beveled shoulders, and provided at opposite ends with an inwardly-turned annular flange, in combination with the threaded pipe-sections screwed into the central projection of the sleeve, the packing ring or washer interposed between the meeting ends of said pipe-sections, and the packing at opposite ends of the sleeve, confined between the beveled shoulders of the central offset of the same and the annular flanges at its opposite ends.

No. 342,225 is a patent for a sewer-pipe, issued to Gracie S. Roberts, of Rockville Centre, N. Y., and consists of a sewer-pipe having a portion surrounded by a line, along which it may be easily severed from the remainder of the pipe, leaving a proper coupling-seat for a branch-pipe.

No. 342,226 is also to the same person for a sewer-pipe, in which a reducer for connection of a branch-pipe to the main, having a portion to enter the main, a stop or collar applying against the exterior of the main, and a bell and connecting parts arranged to operate within the same.

No. 324,161 is a patent for an automatic steam pressure-regulator, issued to Leonidas G. Woolley, of Indianapolis, Ind., assignor to Henry H. McGaffey and Chester Bradford, both of same place, for the combination, with a steam-pipe, of a butterfly-valve pivoted at its centre therein, a branch having a piston therein, a pivoted lever connected to said piston and said valve, and a spring or equivalent device arranged to operate on said lever reversely to the pressure of the steam on said piston, whereby the steam-pressure is automatically regulated.

No. 342,203 is a patent for a water-closet, issued to Patrick Harvey and Frank A. Wells, of Chicago, Ill., for the combination with a soil-cavity discharging at the bottom, a syphon communicating with the soil-cavity at its discharge-orifice, having its crest higher than said orifice, and its discharging-mouth lower than said orifice, and provided with a vent, and an automatic valve to close the same, and the valve to close its discharging-mouth.

No. 341,905 is a patent for a low-water safety attachment to a boiler, issued to James S. Griffith, of Springfield, Ill., assignor of three-fourths to Robert G. Speer, of St. Louis, Mo., and consists in the combination of the following elements: An upper flue-tube or crown-sheet having an upwardly-projecting hollow portion, with a fusible-metal-containing tube, and of a safety relieving device.

No. 341,883 is a patent for a furnace, issued to Gilbert A. Colby, of Chicago, Ill. A steam-boiler furnace, the combustion-arch placed directly above the fire and below the boiler, said combustion-arch consisting of conduits extending from the front to rear of the furnace, and separating devices between the conduits, whereby the flame is allowed to pass around said conduits while the conduits, becoming heated, act upon the fuel to aid the combustion and protect the boiler from cold draughts.

No. 341,923 is a patent for a pump, issued to Walter W. Laing and Samuel S. Hutchins, of Paola, Kan., for the combination, with a pump, of a fulcrum pivotally connected with the pump at its lower end, and connected adjacently with the pump near the upper end thereof, a handle pivoted to the upper end of the fulcrum, a vertical slot in the inner end of the handle, a headed bolt fitted therein, a nut on the bolt, the piston-rod, and straps pivotally connecting the piston-rod and bolt.

No. 342,495 is a patent for an apparatus governed by electricity for flushing water-closets, issued to Albert A. Barker, of Worcester, Mass., assignor of one-half to Nathaniel G. Tucker & Son, of same place, for the combination, with the valve of a tank or cistern for flushing water-closets, of an apparatus governed by electricity, consisting of a float, a chain or other connection, means for guiding said float in substantially a vertical direction, and for controlling its upward and downward movements when in operation, a hinged lever, having an armature mounted thereon, an electro-magnet, and means for supporting the various parts in position.

NEW CATALOGUES.

WE have received the edition for 1886 of the volume entitled, "The Worthington Steam-Pumping Engine," being a history of the invention and development of the H. R. Worthington pumps, and a consideration of their performance commencing with the tests

made at the Centennial Exhibition and ending with illustrations and diagrams of performance of the Worthington high-duty engine, lately perfected, showing their application to reservoir, stand-pipe, and direct pressure systems of water-supply, together with the Worthington meter.

WE have received the Hay & Prentice Co., of Chicago, catalogue of iron and steel wrought welded boilers for hot-water heating apparatus manufactured by this firm.

PERSONAL.

JAMES CASEY, railroad contractor, died at Erie, Pa., June 3.

Association News.

THE AMERICAN SOCIETY OF CIVIL ENGINEERS held the semi-monthly meeting on Wednesday, the 2d inst. A valuable paper was read by Prof. Palmer C. Ricketts, of Troy, on "Some Constants of Structural Steel." The paper gave full details of the methods pursued in testing and results reached by a large number of very careful experiments on open-hearth and Bessemer steel and iron rods $\frac{1}{4}$ -inch diameter. Results were given for compression, tension, and shearing, the modulus of elasticity being given for all. The important point was made that the ratio between shearing and tensile strength, which was given as about 0.75 for soft steels, becomes less as the amount of carbon is increased or for harder steels. These experiments also showed less uniformity in the Bessemer than in the open-hearth steel experimented on.

RENSSELAER SOCIETY OF ENGINEERS.—A convention will be held in Troy, N. Y., June 15. A business meeting will be held at the society rooms at 10 o'clock A. M. Officers for the ensuing term will be elected, and plans relating to the welfare of the society will receive careful consideration. At 2.30 P. M. the members will take the New York Central train for Albany, where the Capitol will be inspected under the escort of the architect, Mr. Leopold Eidlitz, who has offered to describe the interesting features of the building. Members who cannot get to Troy in time for the morning meeting can join the party at Albany. At 8 P. M. Mr. Francis Collingwood, C. E., will deliver an address in Harmony Hall on "Some Often Neglected Duties of the Engineer." At 10 o'clock P. M. a banquet will be given to the visiting members and invited guests by the resident members.

PHILADELPHIA ENGINEERS' CLUB.—At the meeting, May 15, Mr. E. S. Hutchinson read a paper giving a *resume* of the report of the Hon. John Bigelow on the Panama Canal made to the New York Chamber of Commerce. Dr. R. P. Robbins read an interesting account of the first permanent tramway in America, which was projected by Mr. Thomas Leiper, of Delaware County, Pa., in 1809, for the transportation of stone. Prof. L. M. Haupt exhibited an original drawing of Josiah White's, containing designs for Dams Nos. 3 and 4 on the Lehigh. They were built of round timbers, filled with rip-rap, and were each about 36 feet high. Mr. White is known as the inventor of the earliest form of movable dam, known as the "Bear Trap," which he built at the mouth of the Lehigh, at Easton, in 1818. Prof. Haupt also presented some extracts from a paper on the Philadelphia Traction Company's lines by Mr. H. R. Stoops. The secretary announced the death of a member, Mr. E. F. Loiseau, in Belgium.

CHICAGO MASTER PLUMBERS.—The annual meeting of the Chicago Master Plumbers' Association was held June 2, President T. C. Boyd in the chair, and 58 members present. Three new members were admitted. Treasurer J. J. Hamblin, in his annual report, said that he had handled \$2,844.27 during the year, and had a balance on hand of \$857.06. Nineteen members had been dropped for non-payment of dues, and there were now 148 members in good standing. Secretary Beaver complimented the association as the banner one of the country, and its members had increased 45 since January 1. Sergeant-at-Arms Tipple reported no knock-downs. President T. C. Boyd reported a very successful year, especially so in the lectures by Messrs. Hamblin, Whitford, Murray, Brooks, Alcock, Moylan. Friendly relations now existed between the makers of goods and the master plumbers. Health Commissioner DeWolf was quoted as saying that he would like all his health inspectors to be plumbers. He urged

that Chicago, Hyde Park, Lake, and Lake View decree that all sewers under houses be of heavy cast-iron, and that no catch-basin be nearer a building than six feet. The special contract committee had brought the association to the front. The National Association should be upheld and sustained. When the speaker became president the association numbered 95, and now there were 148 members. The election of officers being in order, T. C. Boyd was put in nomination by E. Baggott, who was followed in eulogistic remarks by Messrs. Wade, Young, Rock, Moylan. Mr. Boyd was re-elected unanimously, and replied fittingly. Joseph Alcock was elected Secretary. "Honest Jack Hamblin" was elected Treasurer again by acclamation, and accepted on one condition, that if he allowed anybody to run thirty days over time they should kick him out. John Griffith, William Bowden, Martin Moylan, D. Bain, and M. Reilly were elected vice-presidents. George Tipple was elected Corresponding Secretary. P. O'Hara was installed as Sergeant-at-Arms.

A private meeting was held, with A. Young, chairman, the officers of last year being asked to retire, and some \$300 were subscribed as a substantial testimonial to said last year's officers, and Messrs. Monahan, Moylan, Conlin, and Young were appointed to still further augment the offering of gratitude.

BALTIMORE MASTER PLUMBERS.—(From our regular correspondent.)—The meeting of May 27 was called to order by the president, Mr. John A. Wilson. The Legislative Committee reported that their labors on the bill presented to the Legislature were successfully ended, as the Governor has appointed the following as commissioners: Drs. J. A. Steuart and McSherry, and Plumbers W. H. Rothrock, George Knipp, and John Trainor. Conjecture is rife as to what the commission will do and what the examination will consist of. The Apprenticeship Committee, to whom were referred the rules offered by the journeymen's association, reported that in view of the fact that the National Association would soon meet, and as in all probability that subject would be acted on by it, the committee deemed it prudent to hold the subject over until after the meeting of the National Association.

At the meeting of June 3, President J. A. Wilson in the chair, a communication was received from President Allison, and referred to State Vice-President Trainor. A communication from J. J. Weaver, Chairman of the Transportation Committee, requesting the secretary to send the number of tickets required for Deer Park, was also received. State Vice-President John Trainor having been present at the meeting of the Executive Committee of the National Association in Philadelphia, gave a verbal account of the proceedings. A communication on the protection question was referred to the State Vice-President. On motion, it was ordered that the chairman of the delegation should be authorized to draw on the treasurer for the amount required to defray the expense of the delegates to Deer Park. One application for new membership was received, also a request to be reinstated by an old member. A meeting of the delegates will be held at 8 P. M. tomorrow, to ascertain what delegates, and how many of their friends, are going to Deer Park, and to discuss other matters referring to the meeting.

NATIONAL ASSOCIATION OF MASTER PLUMBERS.—A meeting of the Executive Committee was held in Philadelphia May 31 and June 1, to complete arrangements for the National Convention, to be held at Deer Park in June. The business of the session was purely executive, being a planning of the details for the big convention, and perfecting the final matters to be acted thereon, such as transportation, programme, etc. The members of the Executive Committee were entertained at supper on Monday night at Reisser's Hotel by a number of members of the craft in the city.

Notes.

For works for which proposals are requested, see also the "Proposal Column," pages 29 and 30.

CONSTRUCTION.

PROPOSALS FOR CONSULTING ENGINEER.—As the authorities of Toronto, Ont., apparently assume that the procuring of professional advisers should be treated in the same manner as the procuring of sand and paving-stones, we insert the following announcement in our "Construction Note" column:

"Applications will be received on or before twelve o'clock noon of Friday, the 2d day of July, 1886, addressed to the undersigned, from engineers of the highest professional standing, to fill the office to be created in this city of 'Commissioner of Public Works and Health,' who shall act as consulting engineer, and direct and supervise all matters pertaining to the various public works of the city at present under the consideration of the following committees—viz.: Works, water, health, property and exhibition; the present officers in charge of the several departments referred to, or of others to be appointed in their place, to act as his assistants in carrying on the various works of the city. The salary of the said commissioner, to be determined by the council, shall not exceed \$6,000 per annum. He shall hold office during the pleasure of the council. The remuneration, however, shall be fixed for a period of five years from the date of his appointment. The acceptance of any application to be entirely in the discretion of the council, and the names of unsuccessful applicants will not be made public.—D. M. Devoe, Chairman Executive Committee. Executive Committee Chamber, City Hall, Toronto."

PUMPING-ENGINES.—The Philadelphia Water Department will receive bids until June 15 for pumping-engines, boilers, and stop-valves, as follows: At the Spring Garden pumping station, on the Schuylkill River, near Girard Avenue bridge, one 20,000,000 pumping-engine and foundation, or two 10,000,000 gallon pumping-engines and foundations; five steel boilers and connections at the Spring Garden station; two steel boilers and connections at the Roxborough pumping station; ten 48-inch stop-valves, two of which are to be of the old style, screw lift, and eight of a new department design. All bids must be accompanied by a certificate from the city solicitor of the filing of a bidder's bond in the sum of \$500. Address proposals to John L. Ogden, Chief Engineer of the Water Department, Thirteenth and Spring Garden Streets, Philadelphia.

PHILADELPHIA.—Plans have been prepared by Mr. Isaac S. Cassin, formerly of the Water Department, to provide a supply of water for Holmesburg, in the 23d ward in this city. The Source will be Willitt's Dam. The plans provide for a reservoir, stand-pipe, and pumping engines, and a daily supply of about 60,000 gallons. The cost is estimated at \$40,784. The principal projectors are Joseph Brown, J. Rowland, W. Rowland, Jr., and A. C. Shallcross, of Holmesburg. It is proposed to form a stock company to build the works.

SCHENECTADY, N. Y.—The Water Commissioners on June 4 reported to the Common Council in favor of purchasing a 3,000,000-gallon compound-condensing pumping-engine, with boilers, estimating the cost at \$16,000; also, for the expenditure of \$6,000, to change the location of the intake of the water-works; and an expenditure of \$6,400 for extension of iron water-mains. Action will be taken at the next meeting.

SALT LAKE CITY.—On June 1 the City Council adopted the report of the Committee on Water-Works, advising the expenditure of \$50,643 to provide a water-supply for what is known as the "Dry Bench" district of the city. The committee is Thomas G. Webber, John W. Taylor, John Q. Cannon, and Charles Brown.

HAMILTON, ONT.—In the matter of the new pumping engines the engineer of the water-works will prepare specifications at once, on which the council will ask for proposals.

LONOKE, ARK.—The matter of building water-works is being agitated. The prospects are good for both water and gas works.

JANESVILLE, WIS.—The Water Commissioners will sink an artesian well for the water-works.

BALDWINVILLE, N. Y.—Moffett, Hodgkins & Co., of Watertown, N. Y., will organize a water-works company and make surveys, preparatory to building works.

BALTIMORE, Md.—A proposal for a \$1,000,000 loan for park and other improvements has passed one branch of the city legislature and is pending in the other.

SAUGERTIES, N. Y.—A special election will soon be held to decide granting a New York company the right to lay water-mains and furnish water.

GOVERNEUR, N. Y.—The village has decided that it wants sewerage, and a survey and report will be made at once.

SUMTER, S. C.—On June 8 a popular vote will be taken to decide whether or not the water-works shall be enlarged at a cost of \$20,000.

NEWARK, N. J.—Plans for pumping engines for the Salt Meadow sewer have been prepared by Engineer Schaeffer.

HUNTSVILLE, ALA.—A street-railway will be built here by the Huntsville Street-Railway Company.

JERSEY CITY, N. J.—The Board of Freeholders on Thursday last decided to advertise for proposals for a 50-foot wide, also for a 60-foot iron girder bridge, over the railroad cut at Avenue C. Bidders must furnish their own plans and specifications.

HOT SPRINGS, ARK., is trying to raise \$100,000 to insure the commencement of a railway from that place to Little Rock.

SHERMAN, TEX., has raised \$100,000 as a bonus to the St. Louis, Arkansas and Texas Railway, to extend that road from Mt. Pleasant to Sherman.

SYRACUSE, N. Y.—Messrs. William A. Beach, T. D. Wilkin, Charles Hubbard Thomas Hogan, and G. Lewis Merrill are a committee to make preparations for the building of a park, which will be furnished with a large fountain. A civil engineer will be engaged to make the plans, etc.

CHATFIELD, MINN.—A reservoir will be built on Winona Hill, and pipe laid to provide water for fire purposes.

PUTNAM MONUMENT.—The committee met in Hartford, Conn., last week and decided that the three best designs were those of E. S. Woods, Karl Gerhardt, and George Keller.

BOSTON, MASS.—The Legislative Committee has reported in favor of postponing favorable action on the charters of elevated railroads until the next session of the Legislature.

SOMERVILLE, MASS.—At the meeting of the Committee on Sewers of the Somerville City Government, June 4, the new and novel system of sewerage, as suggested by City Engineer George A. Kimball, was further discussed and voted to report in favor of the idea to the Board of Aldermen. The new system is the largest which has been built in Somerville for a great while, embracing, as it does, something over a mile of thoroughfares. The streets to be drained are Vernon, Lowell, Hinckley, several thoroughfares, and Jenny Lind and Partridge Avenues. The cost is estimated at about \$5,000, while, according to the method in general use, taking away rain-water as well as sewage matter proper, it would be about \$90,000.

MILWAUKEE, WIS.—J. McMahon was given the contract on June 1 to pave Broadway from Buffalo to Menomonee Streets for 13 cents per square yard. The material is stone, which is furnished to the contractor by the city.

The work of laying the new 36-inch main on Prospect Avenue is progressing rapidly. Michael Philbin, of Chicago, has the contract. He is putting in the pipe at \$1.35 per foot. The pipes weigh about 6,500 pounds each, and are 12 feet long. They cost \$24.74 a ton, or about \$80 each pipe. The length of the new main is 10,540 feet, or nearly two miles, and will require 875 pieces of 36-inch pipe.

CINCINNATI, JUNE 5.—A. H. Andrews & Co., Chicago, Ill., were the successful bidders for the new county court-house furniture at \$47,807.60. Owing to the strikes they were the sole bidders.

BOSTON, MASS.—Proposals were received June 1 for the improvement of shallow flowage in Basin No. 3. Section F comprises 19,500 cubic yards of earth; section G, 15,500 cubic yards; section H, 15,500 cubic yards; section I, 18,500 yards, and section J, 10,500 yards; the work of excavation in each section to be completed by October 15, 1886. The bids were as follows:

Sections.	F.	G.	H.	I.	J.
S. L. Barry	26½	27	28	28½	28
Neil McBride	23	30	34	34	24½
Henry Megan	25	26	33	31	24
Thomas F. & John McManey ..	31	34	30	33	30
S. H. Munson	33	31	30	30	33
August Saucier	24	24½	27	28	29
Joseph McManama	24½	24	25½	24½	22½
John H. Rooke	24	24	29	26	25
Henry A. Hancox	27	29	29	27	27

The contract for section F was awarded to Neil McBride, section G to John H. Rooke, and for sections H, I, and J to Joseph McManama.

The City Engineer has presented to the Mayor a plan for removing sewage pollution

from Stony Brook, below the works of the Boston Belting Company. The plan recommended contemplates the building of a sewer 536 feet in length in Linden Avenue and Vernon Street, to cost about \$1,600; also to build a portion of the branch of the main drainage system, designed to receive the sewage from the "Brighton district," which the Massachusetts drainage commissioners have proposed to utilize for connecting the sewerage systems of Brookline and other towns and cities with the main drainage system of Boston. The estimated cost of this sewer is \$33,000. Another to connect with the main system, costing \$500. The engineer also recommends a sewer parallel with Stony Brook to Beacon Street, to the main sewer at Hereford Street. No estimate of the cost of this sewer is given.

Common Council has passed in concurrence an order for the construction of a system of high-service water-works on Bellevue Hill, West Roxbury, to cost not more than \$45,000.

LIMA, O.—The following bids for pumping-engines, boilers, etc., were received by Water-Works Trustees, May 26, 1886:

George F. Blake, two 2,000,000 compound condensing, \$17,500; two 3,000,000 compound condensing, \$21,500; foundations and boilers.

Knowles Steam-Pump Co., one 3,000,000 compound condensing, \$9,000; one 2,000,000 compound condensing, \$7,000; no foundation.

Henry R. Worthington, one 3,000,000 compound condensing, \$8,315; one 3,000,000 compound condensing, \$10,315; one 3,000,000 compound condensing, \$12,575; one 2,000,000 compound condensing, \$7,520; one 2,000,000 compound condensing, \$11,150; two 63"x16" boilers, \$3,310; two 60"x16" boilers, \$2,735; erected with foundations.

Deane Steam-Pump Co., two 3,000,000 and three 63"x16" boilers, \$21,150; two 2,000,000 and one 63"x16" boiler, \$14,400; no foundation.

Holly M'f'g Co., one 3,000,000 engine, compound condensing, \$11,500; one 2,000,000 engine, compound condensing, \$9,250; one 3,000,000 non-compound, \$8,500; one 2,000,000 non-compound, \$7,000; engine and boiler foundations; boilers, each, \$1,350.

Gordon & Maxwell, one 3,000,000 high-duty Corliss, \$15,000; foundation, \$2,000; one 2,000,000 high-duty Corliss, \$9,500; foundation, \$1,000; one 3,000,000 duplex compound condensing, \$12,300; foundation, \$900; one 2,000,000 duplex compound condensing, \$4,500; foundation, \$500; two 63"x16" boilers, \$2,800.

Smith, Vaile & Co., one 3,000,000 compound condensing, \$6,800; two 3,000,000 compound condensing, \$12,800; two 2,000,000 compound condensing, \$9,800; one 2,000,000 compound condensing, \$5,200; foundations \$470 each.

Phoenix Iron Works, two 63x16-inch boilers, \$2,600; two 60x14-inch boilers, \$2,300; two 60x16-inch boilers, \$2,400; with foundations and setting.

Barney & Kilby, two boilers, \$2,875; two boilers, mud-drums, \$2,955; two boilers, f. o. b. Lima, \$2,175; two boilers, mud-drums, f. o. b. Lima, \$2,255.

The boilers are to be ½ shell ½-inch head.

CINCINNATI, O.—The contract for excavations and masonry of the new Chamber of Commerce at Cincinnati, designed by the late Mr. H. H. Richardson, has been awarded to Patrick Murray at his bid of \$30,287, he to have the material in the old building which was the custom house and post-office.

THE ARCHITECTURAL LEAGUE OF NEW YORK.

The League will make an excursion to Albany, leaving New York by night-boat (People's Line) at six o'clock, on July 9, from pier 41, foot of Canal Street. July 10 will be spent in Albany, and the party will leave Albany by night-boat in the evening. Commissioner Perry has kindly consented to meet the members of the League and conduct them over the Capitol building. The city hall, the old Van Rensselaer and Livingston mansions, and other points of interest, will also be visited.

Architects not members of the League are cordially invited to join in this excursion. The cost of the trip will be \$4.50, exclusive of meals. Those who desire to join this excursion are requested to send their names at once to any member of the undersigned committee. The committee earnestly request that there be no delay in sending in names, as they need to know how many are likely to participate before making final arrangement.

F. A. Wright, 149 Broadway; James D. Hunter, Jr., 57 Broadway; H. Langford Warren, Chairman, 96 Fulton Street.

Building Intelligence.

We solicit from each and every one of our readers information relating to projected buildings in their locality, and should be glad to receive newspaper clippings and other items of interest.

ABBREVIATIONS.—b s, brown stone; br, brick; br st, brick store; b s dwell, brown-stone dwelling; apart house, apartment-house; ten, tenement; e, each; o, owner; a, architect; b, builder; fr, frame.

NEW YORK CITY.

2d av, n e cor 7th st, 5-story br flat with store; cost, \$35,000; o, Mary E. Byrne, 118 2d av; a, Babcock & McAvoy.

3 Allen st, 5-story and bmt br and stone front ten; cost, \$20,000; o and b, Charles Downey, 207 E 107th st; a, J. H. Valentine.

78 Henry st, 5-story br ten; cost, \$10,000; o, Fanny C. Hawkins, 61 Lefferts Pl, Brooklyn; a, Boeckell & Son.

390-96 Washington st, 5-story br factory, cost, \$40,000; o, Charles De H. Brewer, 10 Wall st; a, H. R. Marshall; b, Jere. C. Lyons.

524-28 E 13th st, 3 5-story br tens cost, ea, \$15,000; o, John M. Schmidt, 13 2d av; a, J. Boeckell & Son.

Attorney st, n s, 100 w Rivington st, 5-story and bmt br ten; cost, \$22,000; o, Fay & Stacom, 337 Pleasant av; a, A. B. Ogden & Son.

104-6 W 17th st, 5-story br furniture warehouses; cost, \$35,000; o, Thomas Kelly, 345 W 55th st; a, Joseph M. Dunn.

34th st, s s, 300 e 2d av, 5-story br ten; cost, \$17,500; o, John Courtney, 322 E 34th st; a, John C. Burne; b, not selected.

92d st, n w cor Lexington av, 6 houses, and Lexington av, w s, 80.8 n 92d st, 1 house, in all 7 3-story and bmt br (stone front) dwells; cost, each, \$15,000; o, John P. C. Walsh & Bro., 1300 2d av; a, C. A. French & Co.; m, Walsh Bros.; b, not selected.

97th st, n s, 140 w 1st av, 5-story br ten; cost, \$17,000; o, Solomon Mehrbach, 74 E 54th st; a, John Brandt.

4th av, e s, 25.6 s 81st st, 5-story br flat; cost, \$18,000; o, William B. Pope, 100 E 85th st; a, Geo. C. Pope.

77th st, s s, 145 e Lexington av, 3-story br stable; cost, \$13,000; o, Jacob H. Schiff, 932 5th av; a, De Lemos & Cordes; b, D. T. Bumstead and V. J. Hedden & Sons.

2d av, s w cor 109th st, 6 5-story br tens; cost, each, \$18,000; o, Cunningham & Riley, 416 E 15th st; a, Babcock & McAvoy; b, not selected.

70th st, s s, 170 e 2d av, 5-story br ten; cost, \$20,000; o, Max Danziger, 11 E 79th st; a, John C. Burne; b, not selected.

72d st, s s, 246 w 4th av, 3 4-story br dwells; total cost, \$100,000; o, Max Nathan, 70 E 71st st; a, Wm. Schickel.

91st st, n s, 45 e Madison av, 3-story and bmt br (stone front) dwell; cost, \$12,000; o, Emeline Johnston, 51 E 91st st; a, A. B. Ogden & Son.

110th st, s s, 70 w Lexington av, 4-story br flat; cost, \$19,000; o, Catherine Boltz, 137 E 117th st; a, C. Baxter.

1st av, s e cor 94th st, 2-story br dwell; cost, \$5,000; o, Frank Willenbrook, 1038 Greene av, Brooklyn; a, John Brandt.

74th st, s s, 100 w 9th av, 10 4-story and bmt br (stone front) dwells; cost, ea, \$18,000; o, Margaret Brennan, 417 W 69th st; a, Thom & Wilson; b, day's work.

63d st, s s, 525 w 9th av, 2 5-story br (stone front) flats; cost, each, \$20,000; o and b, Gilie, Walker & Lawson, 519 W 104th st; a, M. V. B. Ferdon.

134th st, s s, 460 w 5th av, 6 3-story and bmt br dwells; cost, each, \$10,000; o and a, David T. Davies, 149 E 125th st.

8th av, s e cor 142d st, 5-story br flat with stores; cost, \$20,000; o, Edward Dressler, 278 Pleasant av; a, E. L. Angell.

125th st, n s, 235 w 5th av, 3 5-story apart houses; cost, each, abt, \$40,000; o, Peter N. and Wm. H. Ramsey, 326 W 60th st; a, James E. Ware.

127th st, n s, 225 w 6th av, 6 3-story and bmt br (stone front) dwells; cost, each, \$9,000; o, Martin E. Deegan, 1918 Lexington av; a, J. H. Valentine; b, Valentine & Deegan.

7th av, n w cor 129th st, 2 and 3-story br and stone front church, chapel and parsonage; cost, \$80,000; o, West Harlem M. E. Church; o, Bartlett Smith, President Board of Trustees, 136 W 122d st; a, J. R. Thomas.

Continued on page 41.

THE SANITARY ENGINEER.

DEVOTED TO

ENGINEERING, ARCHITECTURE, CONSTRUCTION, SANITATION.

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SEWAGE UTILIZATION AND FARMING AT PULLMAN.

At a recent meeting of the Society of Arts, Dr. C. M. Tidy delivered an address on the "Treatment of Sewage," in which he took the ground that it was "incompatible to combine any treatment of sewage with both sanitary and commercial success." This has been the position THE SANITARY ENGINEER has always held, notwithstanding the rose-colored statements of promoters of special methods of treatment, and of that class of writers who assume that Providence has intended that all waste matter should be returned to the earth, and that it is a wicked waste to discharge it into the sea, even if removed where it could be of no offence.

The adoption of a proper method of sewage disposal, as is the case with all other engineering undertakings, must be controlled by local circumstances. If sewage cannot be discharged into the sea or into a rapidly flowing river, in which the risk of a nuisance to dwellers on its banks will be practically *nil*, then the question of disposal by broad irrigation would naturally come under consideration. This would have to be controlled by the ability to acquire suitable land at a reasonable cost for the purposes of a sewage-farm. If this cannot be done, then the various processes of precipitation must be considered, and the amount of water in the sewage is an important element in the problem.

The most favorable accounts as to the profitability of conducting a sewage-farm that we have seen have been those published regarding the one at Pullman, Ill., in which this farm, which has been assumed to have been conducted as a model sewage-farm, has been shown to make a profit. A recent visit, however, to Pullman explained the reason of this alleged commercial success, which is due to the fact that the farmer manages the farm to raise crops and make money, only utilizing as much sewage as he needed to promote the raising of crops. In dry weather, and whenever no injury is done to standing crops, it is allowed to flow upon the fields. At other times it is either turned, during a part of the year, on a number of filter-beds, or, as these too are cultivated in turn, it is allowed to run in a crude state into the lake through an open ditch.

We cite this instance not to find fault with the management of the farm at Pullman, since it is conducted by the Pullman authorities in such a way as to satisfy themselves, they owning all the property in the neighborhood and there not being any neighbors to complain. The point we desire to make is, that as a farm for the utilization of the sewage of a town, it cannot fairly be called a model sewage-farm as it is conducted to-day. This, however, is no argument against the putting of sewage on land wherever practicable, and the raising of crops by its aid, and the purpose of this article is simply to call attention to the fact that no community should be misled by statements that would lead them to expect that they can conduct a sewage-farm that will utilize their sewage in an inoffensive way and at

the same time secure a return from the crops sold that will pay a profit on the cost of disposal. The most they can hope for to-day is to get back a portion of the expense of disposal from the sale of crops.

THE MASSACHUSETTS STATE BOARD OF HEALTH.

THE Bay State has again a State Board of Health which its sanitarians and physicians recognize and approve, and they are well pleased with the change.

The so-called State Board of Health, Lunacy, and Charity, organized in 1879, has never given satisfaction, and has been under a cloud from the first, owing to the strong and very natural suspicions which prevailed as to the motives for its creation. The board now created is substantially on the same basis and has the same duties as the first board, created in 1869, except that its field of action is somewhat enlarged.

The members of the new board are appointed for different periods, as one member goes out of office each year, but all subsequent appointments are to be for seven years. The appointees are as follows: For seven years, Dr. Henry P. Wolcott, of Cambridge; for six years, Dr. Elijah U. Jones, of Taunton (homœopathist); for five years, Mr. J. H. Appleton, of Springfield (a manufacturer); for four years, Mr. T. K. Lathrop, of Beverly (lawyer); for three years, Dr. F. W. Draper, of Boston; for two years, Mr. H. F. Mills, C. E., of Lawrence; and for one year, Mr. James White, of Boston (a retired merchant). It will be seen that the principle observed in the appointments has been to represent as many different interests as possible, and for a board, which has certain legislative and *quasi*-judicial functions, the principle seems to be a good one. We wish the new board a long, prosperous, and useful life.

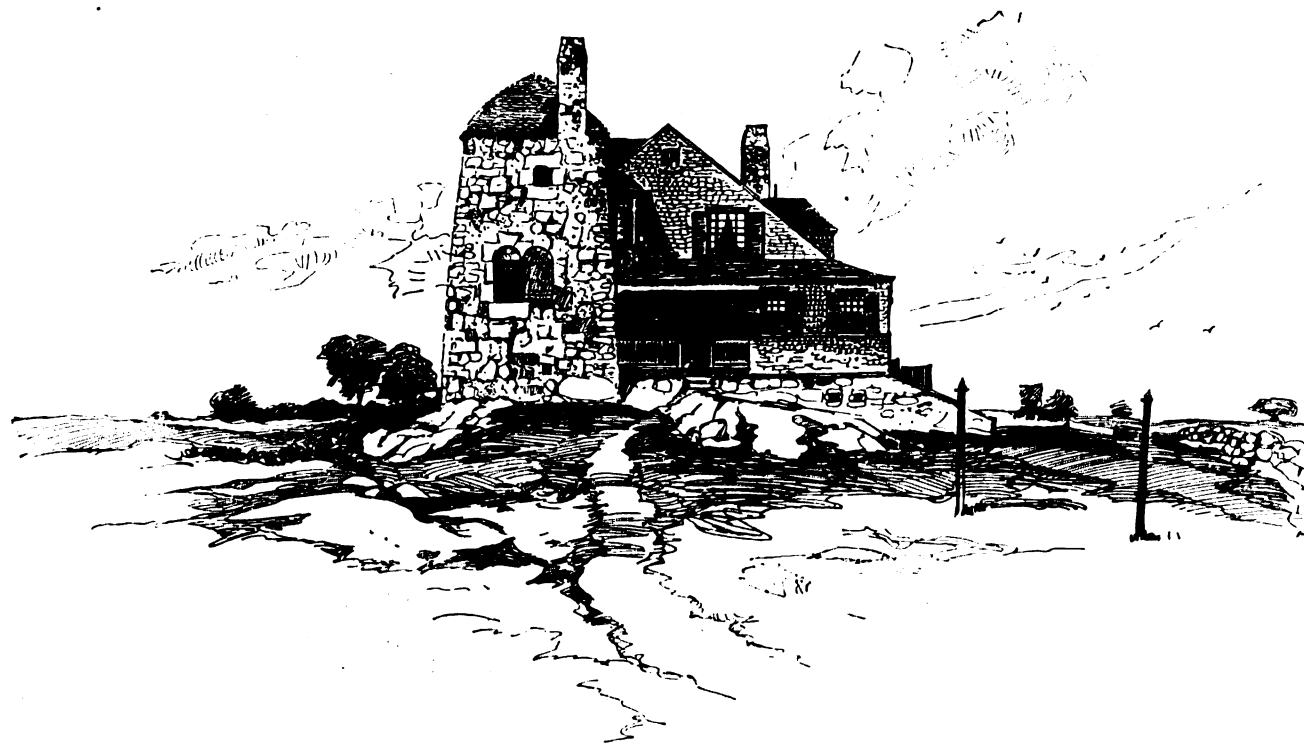
OUR readers will find in a *resume* of a controversy over the question of "joint control" in the matter of the engineering work in connection with the Vyrnwy scheme for the new water-supply of Liverpool, to which we devote elsewhere in this issue considerable space, some instructive reading. The publication of the second letter from Mr. Deacon suggested that, in the absence of the information we have this week given, most of our readers would fail to recognize from the letters of Messrs. Deacon and Hawksley anything beyond a personal dispute about a title. It will be seen, however, that the letters relate to a matter which touches upon principles that are too little recognized in the conduct of public engineering undertakings, especially in this country. Laymen, commissioners, and even engineers may therefore learn a valuable lesson from the experience here recorded.

REPORTS have been made to the Water Committee of the Liverpool Council on the subject of the Vyrnwy dam by Major-General Sir Andrew Clarke, Asst. Inst. C. E., and Mr. Russell Aitken, M. Inst. C. E. These gentlemen arrive at the conclusion that the dam is well built and abundantly strong. From what they report as having seen, they would seem to be justified in these statements; manifestly, however, those only who have *seen* the rock on which the dam rests and the methods pursued in construction can have an intimate knowledge of all the facts. Mr. Thomas Hawksley has taken a different view on several points, and his large experience justifies him in being very tenacious of his opinions. As the differences are respecting facts and not theory it is impossible for us to judge of them except upon details and drawings, which are not in our possession.

ble. Upon a production of a certificate, signed by the medical officer or his assistant, a magistrate's warrant can be obtained empowering the corporation officers to remove any specified person to the hospital. Liverpool is fortunate in the centralization of the sanitary authority for the whole city in one municipal office, which, of course, regulates the whole district, in satisfactory contrast to the numerous vestry authorities of London, where one set of regulations may be in effect in one street and something quite different in the next.

There is a feature in connection with the "Road" of the Liverpool Tramway Company in some of its sections which is, I think, peculiar to the company, and which must have effected a very considerable saving in its original construction. Taking for example that section between the city and Wavertree (a suburb), the line is here to all intents and purposes a single one, but has at intervals of about every hundred yards a loop-line. This loop runs for about another hundred yards, and then runs again into the single line. Although there is at present considerable traffic,

our sewage. He was satisfied that it is so arranged that the population of any given country can grow food enough for all its people by the utilization of its refuse, embracing in the term street and stable sweepings, trade and house refuse, sewage, etc. In the event of a hostile combination of European powers against England, he was assured we should be disastrously defeated, as a starving people would compel submission, all because we will not put the sewage on the land. He stated that the sewage and refuse of 100 people, properly utilized, would grow two bullocks and produce milk enough (from the bullocks or from the sewage?) for the 100 people. The theoretical tracing out of this statement of the doctor will give rather funny results. There are, of course, "expert" opinions for and against the "utility" system, but it is a great pity that any lecturer should present the *reductio ad absurdum* to any audience, and on such groundwork ask it to accept the principles. Following the address of Dr. Carpenter, a London weekly has been giving its readers two alarmist leaders, arguing that as the sewage of London contains the residuum of the food of 4,000,000 of people, it is a



A HOUSE ON THE COAST AT NEWCASTLE, N. H.—E. M. WHEELWRIGHT, ARCHITECT.

OUR BRITISH CORRESPONDENCE.

Private Donations to Establish Public Baths—Treatment of Infectious Disease Cases in Liverpool—The Liverpool Tramway—The Mersey Tunnel Railway—Dr. Alfred Carpenter on Sewage-Disposal—Annual Meeting of the Institute of Civil Engineers.

LONDON, May 29, 1886.

THREE gentlemen, whose names do not transpire, have offered to defray the cost of building and equipment of public baths, to include a large swimming-bath in St. George's-in-the-East. The only condition attached to the offer is, that the vestry shall take over the whole management of the baths, and use for that purpose the whole of the receipts, no portion of which is to be diverted to other objects in the parish. The vestry, of course, accepted this munificent offer. The boon of such a gift to a district so densely populated with the poorer classes, as is St. George's, is incalculable, while it cannot fail to improve the health of the neighborhood.

The procedure of the Liverpool public health officers in connection with cases of infectious diseases is commenda-

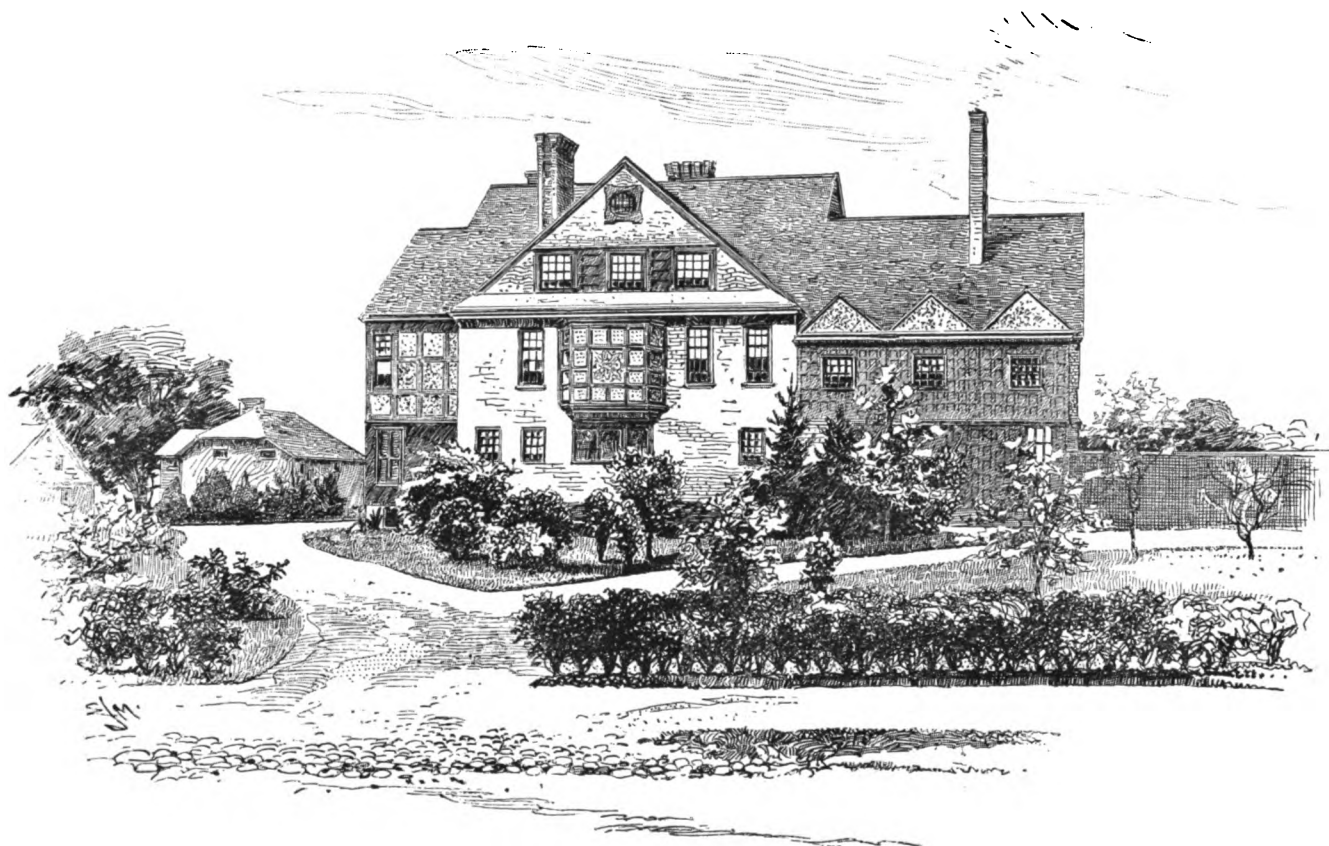
owing to the International Exhibition at Wavertree, cars running to and fro at intervals of some seven minutes, there is no delay in waiting on the loops, as is the case with the usual system of single-line services.

The engineers in charge of the Mersey Tunnel Works, in connection with the new railway which passes under the Mersey between Liverpool and Birkenhead, are experiencing very considerable trouble in connection with subsidence of the land. Unfortunately for the Railway Company, this land is built on, and the result, of course, is a very considerable additional expense. Several blocks of buildings were affected in this respect some months since, and further similar cases are now occurring in Beckwith Street, Birkenhead. The immediate cause of the subsidence would appear to be the withdrawal of immense quantities of water, which collects in the various shafts which have been sunk. This water has to be pumped out daily and passed into the main sewer, and takes with it a quantity of sand and gravel.

Dr. Alfred Carpenter, in a recent address before the Association of Sanitary Inspectors, predicted famine for us, in the not distant future, because we will not utilize

burlesque on common sense to throw it into sea, the process entailing an annual monetary loss of £155,125, reckoning the value as 10s. per ton. Later on it reckons the annual loss as £16,000,000 and compares it to a daily loss of 10,000,000 quartern loaves of bread thrown into the sea. This journal recommends the acquisition of two large depots where sewage in the form of compressed sludge, to the amount of 850 tons daily, may be stored. In other words, if the obstinate landowners and farmers, who have combined to resist the use of the fertilizing product to their own manifest disadvantage, will not use the stuff, save up this enormous quantity until such time as they see the error of their ways.

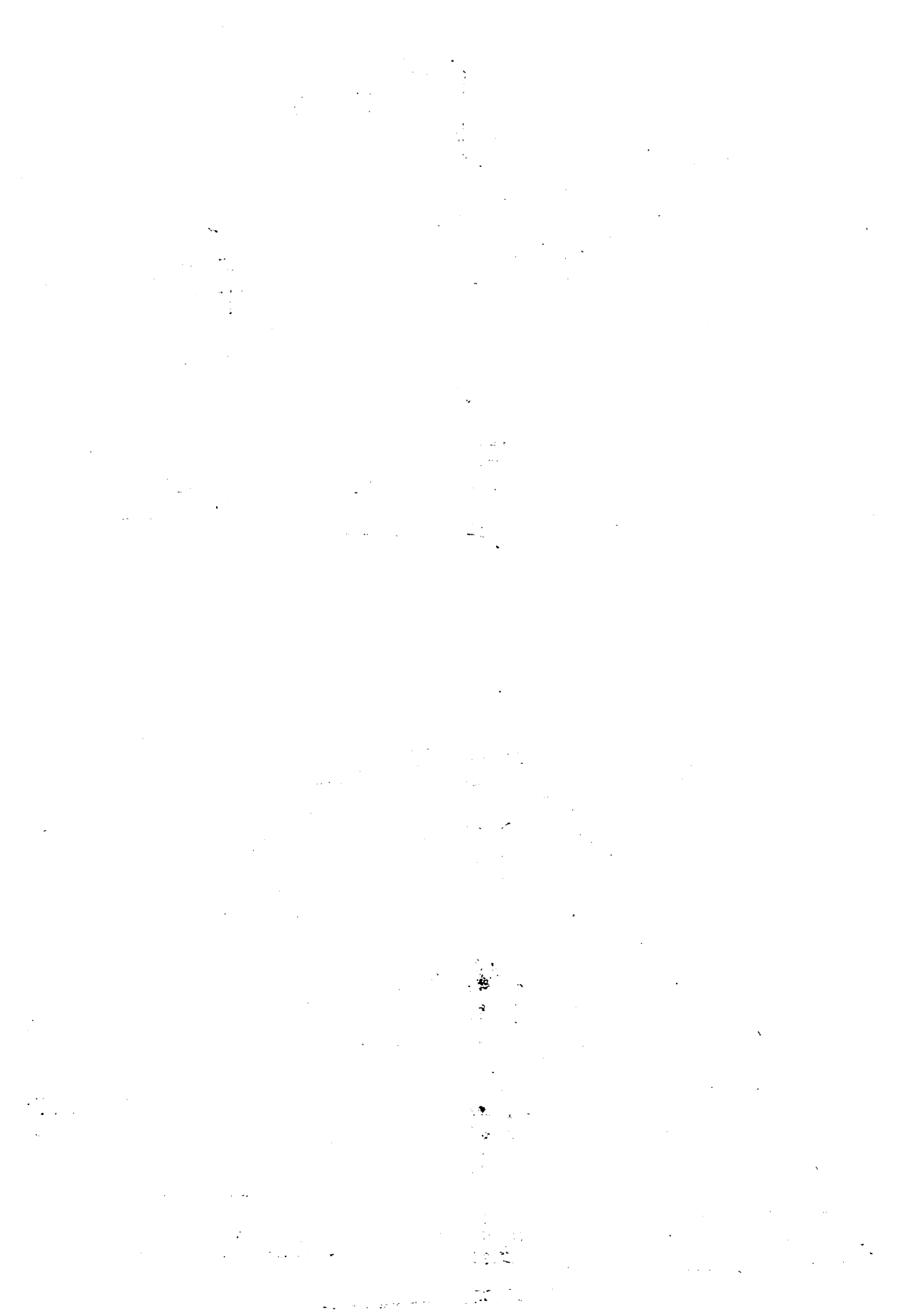
The recent annual meeting of the Institution of Civil Engineers at their commodious premises in Great George Street, Westminster, was one of the largest that has been held for years, upward of 400 members putting in an appearance. The annual report of the council was well received, a burst of applause following the announcement that the present Secretary, Mr. Forrest, had held office for thirty years. The Institution may well be congratulated upon retaining the services of such a secretary, as it is



THE SANITARY ENGINEER ILLUSTRATED SERIES.

A RESIDENCE AT NEWPORT, R. I.

CLARENCE S. LUCE, ARCHITECT.



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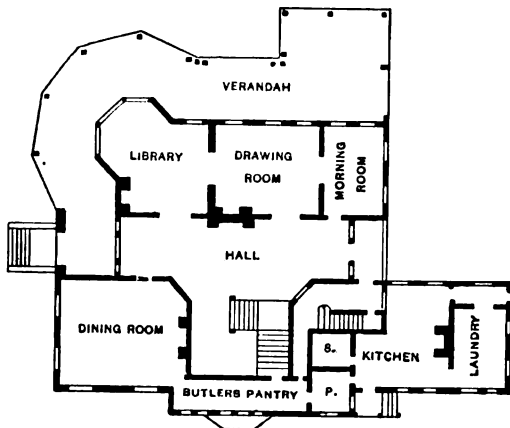
mainly through him that it is in its present prosperous condition, numbering as it does upward of 4,000 members and associates, with an income of nearly £10,000 per annum.

SAFETY-VALVE.

OUR SPECIAL ILLUSTRATION.

A RESIDENCE AT NEWPORT, R. I.—C. S. LUCE, ARCHITECT.

We give this week two views of the residence of Dr. John T. Mason, at Newport, R. I. The house is covered with shingles, which are not stained, but left to weather.



The exterior trimmings, panel-work, and half-timber frame-work are of natural finished ash. The half-timber work and small gables are filled in with beach pebbles set in cement, so as to show a surface all pebbles. The cost of the house was about \$21,000.

The architect is Mr. Clarence S. Luce, of New York.

An electric elevated railroad is projected in St. Louis. The distance to be run is about four and one-half miles, and the bill incorporating the company, which is now before the Missouri House of Delegates, provides that the motive power shall be electricity only.

OUR ILLUSTRATION OF A MODERATE-COST HOUSE.

A HOUSE ON THE COAST AT NEWCASTLE, N. H.—E. M. WHEELWRIGHT, ARCHITECT.

This house is the residence of Mr. Edmund C. Stedman, the poet. It stands on an open stretch of moorland close by the sea, at Newcastle, N. H. The tower and some of the lower portions of the house are of field stone; the rest of the house is framed and covered with stained shingles. The interior finish is very plain, painted pine throughout. The house cost about \$6,500.

The architect is Mr. Edmund M. Wheelwright, of Boston.

THE NEW CROTON AQUEDUCT.

No. IX.

(Continued from Vol. XIII., page 369.)

SHAFTS 31-32, ETC., AND OVERFLOW AT SHAFT 26.

SHAFT No. 26 is 525 feet below shaft 25, and is to have a depth of 116 feet and a section in excavation of 16x16 feet clear of all obstruction from timber or rock. The finished shaft will have twelve feet three inches internal diameter, and the brick lining will be 16 inches thick.

Figure 12 gives a sectional plan, front elevation, and transverse and longitudinal sections of the shaft and overflow-chamber.

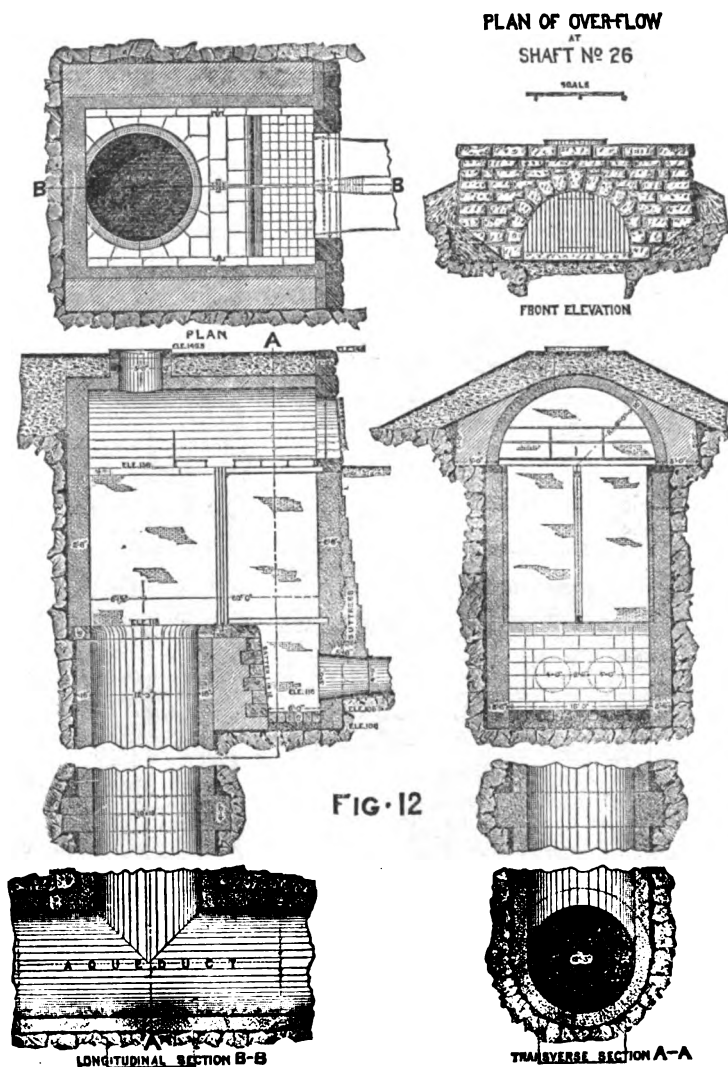
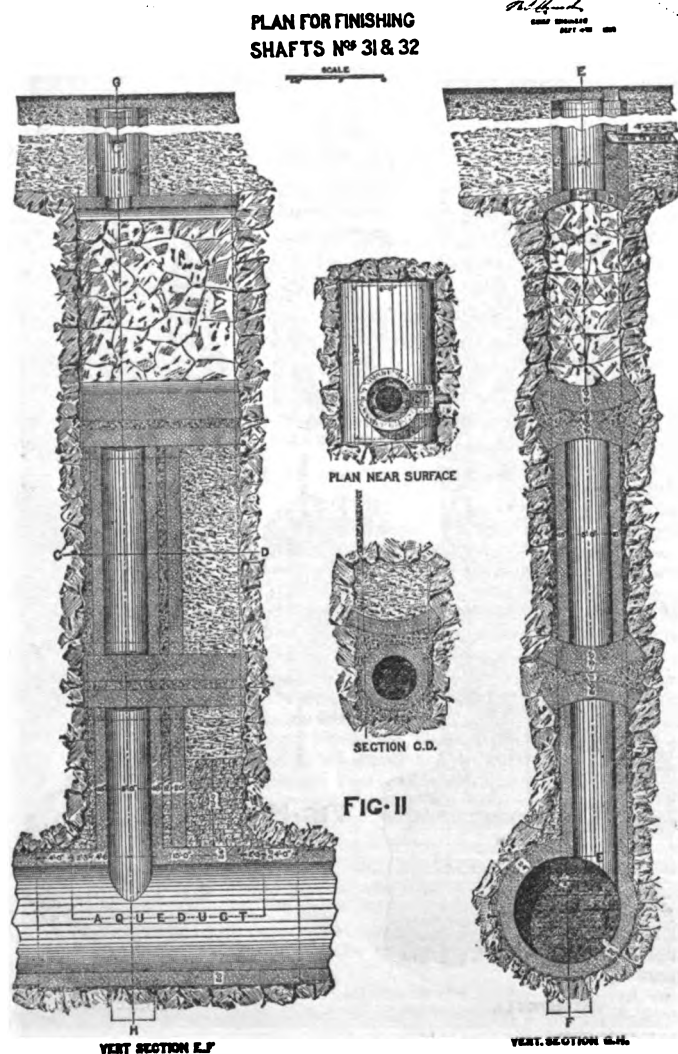
An overflow is provided at the elevation of 118 feet into a receiving-basin 10 feet deep and 16 feet wide, from whence the water will pass through conical entrances into two pipes, four feet each in diameter, leading to the river. The greatest hydraulic head at this point will be 131 feet above datum, it being reduced to this from 140 feet at the Croton dam by frictional resistances. Grooves are shown in plan and section B B for stop-planks, by means of which the whole of this head may be made available to increase the head on the pipes leading from the gate-house at One Hundred and Thirty-fifth Street. This will give a possible variation of 13 feet in the head. The entrance to the chamber will be through the door in the grating shown in the front elevation, and the platform within is to be supported on iron I-beams.

Figure 11 gives the details of the two lowermost shafts on the aqueduct. These will be excavated to 8x17½ feet

in section, clear of all obstructions, and are to be respectively 78 feet and 86 feet deep. The finished shaft will have a 16-inch brick lining of five feet interior diameter. The lining will be surrounded by concrete, and to save concrete about one-third of the section will be cut off, as shown in section C D, for a portion of the height by a 20-inch brick arch with vertical axis, the remaining space being filled with earth. This arch is considered necessary also to prevent any compression of the earth-filling and consequent danger of bursting, as the result of the internal water-pressure. The hydraulic level at these points would cause the water to overflow the surface of the ground, and, as the shafts will seldom, if ever, be used after construction, each will be cut at two points by solid arches, as shown, with a total thickness of six feet at each point at the centre. The uppermost of these will be about twenty feet below the surface of the rock and about 32 feet below the street surface. The 20 feet mentioned will be left unfilled, and a 16-inch arch turned over the space. Above the latter arch the shaft is continued in 12-inch brick-work, and will be closed over by a heavy cast-iron plate at about 20 inches below street grade, the street-paving being made continuous. This plan is adopted so as to make it possible to open the shaft again, should it be necessary, at a comparatively small expense. To provide for the contingency of a possible leakage upward a drain-pipe will join the upper section of shaft with the street-sewer, a side chamber or manhole being arranged for this purpose, to which access can be had through an opening in the street.

Figure 13 shows the construction of shafts 27, 28, and 29. These are to be the same in size as the last described, and have depths respectively of 143 feet, 123 feet, and 114 feet. As these are to remain open, they are provided with ladders, and have an entrance provided through the street surface. It will be noted that the arch to resist horizontal thrust is carried to two feet above the hydraulic level.

Figure 14 gives details of shaft No. 30, which has a depth of 80 feet. As the hydraulic level will be such as to cause water to overflow from it, and it is considered desirable to have ready access to the aqueduct through it, the construction will be quite different from that last described. The dimensions of the excavation, the double arches across, as also the arch with vertical axis, and earth-filling will be



essentially the same. The section next above the aqueduct will be finished with five feet four inches internal diameter. The section next above will be bottle-shaped and oval in section, having diameters of nine feet and six feet. There will be a similar shorter section next above this, which will terminate in a vertical section five feet in diameter, reaching to within 20 inches of the street surface and covered with a cast cover-plate for paving over. The section next over the aqueduct will be joined to the next above, and that with the third by openings about four feet six inches diameter, which will be lined with heavy castings, having strong cast-iron covers securely bolted to them. Valves operated by rods from above will allow of the discharge of water which may have found its way into either of the upper chambers, and a drain near the top will provide for the discharge of water into the sewer should any large quantity force its way upward.

(TO BE CONTINUED.)

LIVERPOOL WATER-WORKS.

THE VYRNWY MASONRY DAM.

LIVERPOOL, May 27, 1886.

SIR: In his letter to you of the 28th ult., printed in THE SANITARY ENGINEER of 13th inst., Mr. Hawksley refers to a letter from the Town Clerk of Liverpool, dated September 14, 1885, regarding my position as Engineer of the Vyrnwy Water-Works; but Mr. Hawksley has omitted to say that—having found prior to this date that the alleged differences between his agreement and my own (both of March, 1881,) were likely to create an unfortunate disruption—I had written to the City Council on May 19, 1885, and subsequently to the Town Clerk, intimating in effect that rather than “cause embarrassment or difficulty to the corporation,” I was prepared to be bound by the terms of Mr. Hawksley’s agreement, without respect to the difference (not admitted, I believe, by the corporation) in the effect of the two agreements. Whether or not any difference of effect existed, this act could not alter the facts as to my position up to that date. Mr. Hawksley did not withdraw his resignation; the concession never came into operation, and the facts remain precisely as stated in your publication of April the 8th ult.

Having projected and worked out and prepared the plans for the scheme of water-supply to Liverpool, I acted as “joint engineer” with Mr. Hawksley for carrying it

through Parliament, and subsequently as “engineer in conjunction with” him for carrying on the works.

It would be fruitless to discuss whether there is or is not any difference in effect between a “joint engineer” and an “engineer in conjunction with,” nor do I care to refer to the statement in Mr. Hawksley’s letter to you, of dissatisfaction as to the way in which I carried on the work, and am still carrying it on, except to say that, although I was well aware of his general expressions of dissatisfaction, Mr. Hawksley never concurred in the courses necessary to remove his objections, except where those courses were adopted.

It is scarcely necessary to add that, in my own judgment, there have been no grounds for dissatisfaction, except such as have arisen from the cost of adapting certain natural conditions to the ends in view; but this question has been referred to others to report upon.

It is much to be regretted that Mr. Hawksley’s letter should oblige me to ask you to publish matter in which your readers can scarcely be interested.

Respectfully, GEORGE F. DEACON.

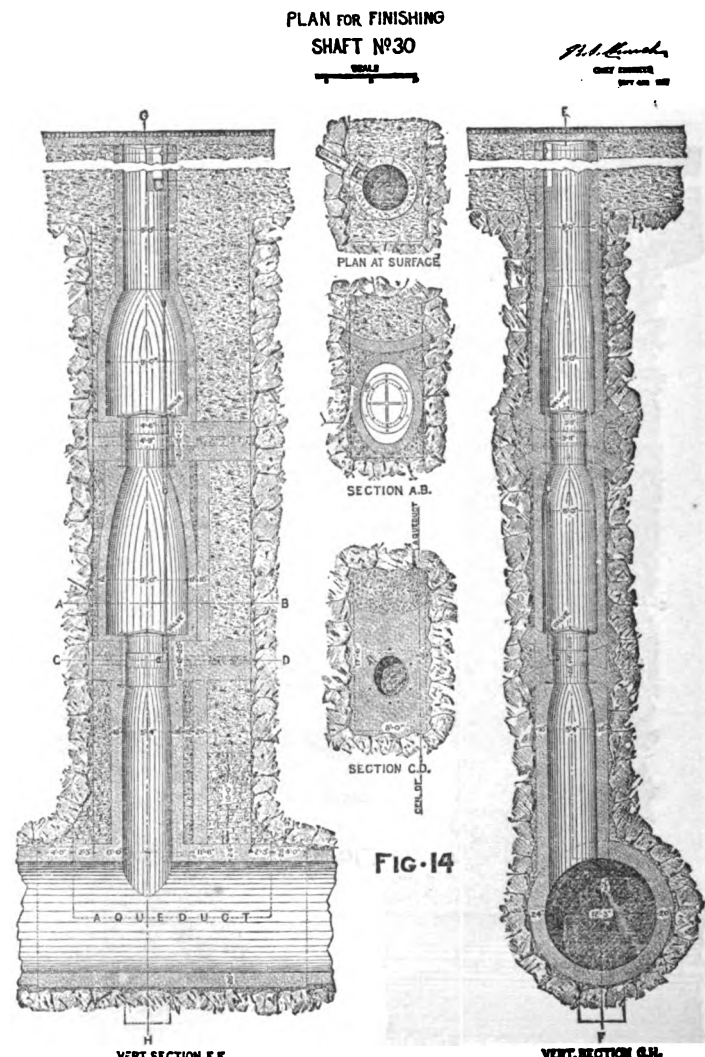
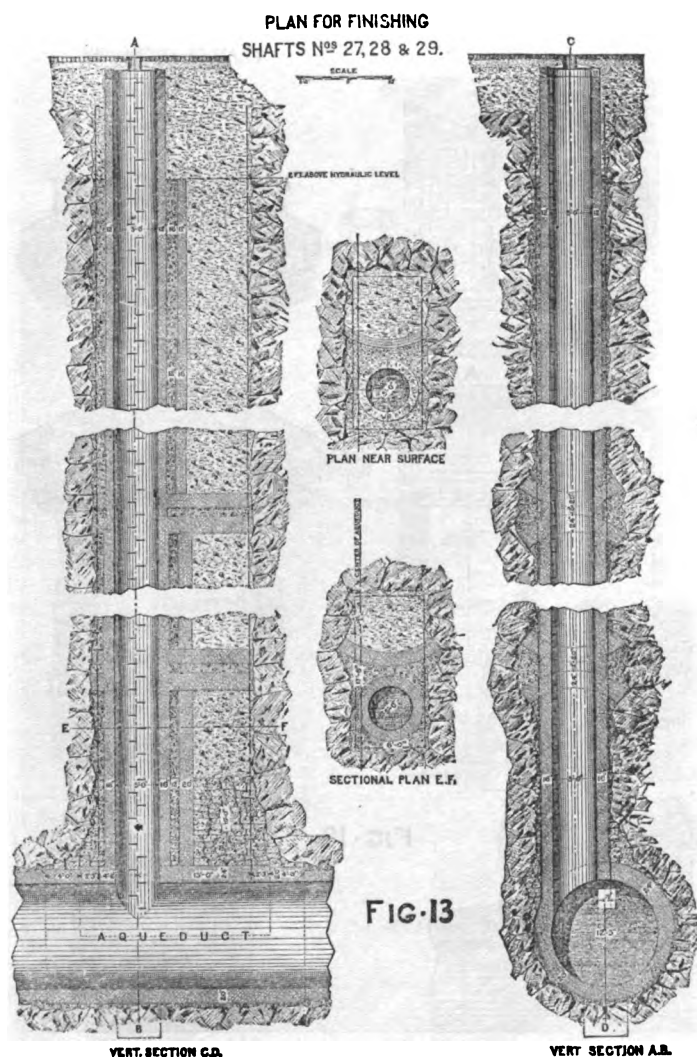
[The apparent conflict in the statements in the various letters of Mr. Deacon and Mr. Hawksley brought out by our reference to Mr. Deacon as assistant engineer in connection with Vyrnwy Dam work may not be of any special interest to a number of our American readers, yet we have decided to print the above letter of Mr. Deacon, and at the same time give a *resume* of the history of the facts which led to this controversy, which we trust will conclude, so far as our columns are concerned, the personal aspect of the case, which to our readers is only a feature, and one that would hardly justify the publication of the above letter. The lessons, however, to be learned from this unfortunate controversy by commissioners are so important, and the principles that should govern the engineering control of all engineering undertakings are so plainly made manifest, that it seems proper to give a summary of the evidence as we have it, quoting such parts as seem desirable for a clear understanding of the points involved.

It will be remembered that Mr. Deacon’s letter, published in our issue of April 8, was brought out because of a reference to him as “assistant engineer” in a description of some work on the Vyrnwy Dam. Mr. Deacon, in that communication, objected to the word “assistant” and claimed that he was “engineer in conjunction with” for the carry-

ing out of the work. Mr. Hawksley, in his letter of April 28 denied that Mr. Deacon was ever “engineer in conjunction with” him for carrying on the work. The justification for the claims of Mr. Hawksley and Mr. Deacon will appear later on in this *resume*. From the evidence, it seems that, prior to 1880, Mr. Deacon, then Water Engineer of Liverpool, was employed for a long time preparing preliminary plans, reports, and estimates of several projects for the water-supply of Liverpool, comparing the relative values of each. After considering the relative advantages of the Haweswater and Vyrnwy schemes, and obtaining reports from Mr. Hawksley and Mr. Bateman on the information furnished by Mr. Deacon, the council adopted the Vyrnwy scheme and decided to apply to Parliament for a bill to carry out the work, as is necessary in all great public undertakings in Great Britain. The Liverpool council found it necessary to procure the services of Mr. Hawksley in order to facilitate the procuring of the Act of Parliament, as explained in the following extract from the remarks of Mr. Bower, the Chairman of the Water Committee at the time the agreement with Mr. Hawksley was under consideration by the council:

“Mr. Bower, in seconding the motion to adopt the agreements, stated that ‘at one time there was an idea that Mr. Deacon should act as engineer to the scheme, but much as he respected him and highly as he appreciated his talent and general ability, he for one never entertained such an opinion.’ He felt this, that with all Mr. Deacon’s ability and talent, he had not the practical experience in carrying out works of such magnitude as would justify their employing him on his sole responsibility. He believed the result had verified the impression which they then entertained, because he was sure if they had not had the experience and ability of Mr. Hawksley they should have failed to carry the bill through Parliament.”

Mr. Bower, at the request of the Water Committee, arranged with Mr. Hawksley for his signing of the plans and acting as “joint engineer” with Mr. Deacon to assist in carrying the bill through Parliament. The Chairman of the Water Committee subsequently maintained that Mr. Hawksley was to act as joint engineer if the work was carried out. On this point he is flatly contradicted by Mr. Hawksley, who states that the “joint engineership” was not to continue after Parliament had sanctioned the scheme.



THE NEW CROTON AQUEDUCT.

Mr. Hawksley explains his understanding of the verbal arrangement with Mr. Bower in a letter to the City Council, dated October 20, 1885, as follows:

- (1) Mr. Bower proposed and pressed his proposition that I and Mr. Deacon should act as joint engineers for the Vyrnwy Works for all purposes.
- (2) I declined, and assigned as reasons—
 - (a) That Mr. Deacon had no experience;
 - (b) That he was then and was to remain a salaried servant of the corporation, and was not, therefore, a free professional man;
 - (c) That Mr. Deacon's financial position would not enable him to take his share of the risks and responsibilities of so great an undertaking.
- (3) Mr. Bower assented to the force of these reasons.
- (4) Mr. Bower next proposed that Mr. Deacon should be recognized as joint engineer for the purpose of application to Parliament for an act.
- (5) After some conversation I assented to this request, on the then stated ground that it would not involve me in any responsibility, and would terminate with the passing or rejection of the bill.
- (6) Mr. Bower next entered on the discussion of the pecuniary terms.
- (7) I informed him that the charges of responsible hydraulic engineers were usually five per cent. on the cost of constructional work.
- (8) Mr. Bower asked whether, if the corporation provided an efficient resident engineer and staff, and relieved me of the cost and trouble of the detail supervision, I would accept the same rate of remuneration as I had received at Leeds and Huddersfield, where I had professional gentlemen of means, experience, and responsibility associated with me. This was the three per cent.—my share of five per cent.
- (9) I assented.
- (10) But again, said Mr. Bower, if we put Mr. Deacon in as we wish to, we shall have to pay him a much higher salary than to an ordinary resident engineer.
- (11) At last I said, after demurring considerably, then put my remuneration at 2½ per cent., and give Mr. Deacon what you please.
- (12) Soon after this Mr. Bower again returned to the charge, saying, "But, then, you know, there will be the Parliamentary costs. I think, considering all the circumstances of the case, and that we have had a considerable staff of surveyors for some time on the work, and that you will personally have very little trouble (the opposite afterwards proved to be the case), you ought to allow your fees, if the bill is obtained, to merge into the 2½ per cent.; but if not obtained, you shall be paid your regular charges."
- (13) I did not by any means see the cogency of this reasoning, but I admitted that, being overcome by the bland manner and seductive expressions of Mr. Bower, I again yielded.

The bill having passed, and received the Royal assent, the chairman, in his report, states that it then became necessary to enter into an agreement with Mr. Hawksley in accordance with the verbal arrangement he had made with him in Paris. The late Town Clerk also advised that it was prudent to enter into a contract with Mr. Hawksley, and two copies of the agreement were prepared by the Town Clerk, and one was submitted to Mr. Hawksley for his approval. Mr. Hawksley promptly objected to the words "joint engineer," besides other items in the form of agreement submitted to him.

This was in December, 1880. Then follows correspondence between Mr. Hawksley's solicitors, the Town Clerk, and Mr. Bower, all indicating that Mr. Bower, Chairman of the Water Committee, was trying to overcome, by means of letters and interviews, Mr. Hawksley's opposition to the "joint engineership," and by some means or other secure that position for Mr. Deacon, and it was not until March, 1881, that an agreement was made satisfactory to Mr. Hawksley, in which his position was defined as follows:

"And whereas it has been agreed that the said *Thomas Hawksley* shall act as *Engineer-in-Chief of the Corporation*, in the carrying out of the works hereinafter mentioned, authorized by the act."

"1. Now it is hereby agreed by and between the corporation and the said *Thomas Hawksley* that the said *Thomas Hawksley* shall (with the assistance as hereinafter mentioned of the said *George Frederick Deacon*, or such other engineer as shall for the time being be appointed by the corporation to perform the duties hereinafter provided to be performed by the said *George Frederick Deacon* or other the engineer to be appointed in his stead) act as the *Engineer-in-Chief of such reservoirs and other similar works as the corporation have determined or may hereafter determine to construct under the powers of the act*, and of the tunnels and first line of pipes from the Vyrnwy Reservoir to the Prescott Reservoir, and of the whole or so much of the filter-beds and other works connected therewith, and of so much of the second and third lines of pipes as may be constructed and laid simultaneously with the laying of the first line of pipes on the terms and conditions herein stated."

"2. All orders, instructions, or directions of the corporation relating to the said works shall be duly recorded in the proceedings of the Council, or of the Water Committee of the Council, and copies thereof, under the hand

of their Town Clerk, shall be notified to the said *Thomas Hawksley*, by being given to him or left at or sent by post to his place of business, and he shall be deemed thereupon to have had due notice thereof."

"3. The corporation may, from time to time, direct which of the said works shall be constructed, and in what order, and may rescind or alter their resolutions thereon as they may from time to time think fit. And the corporation shall provide all necessary inspectors, clerks of works, timekeepers, testing officers, and other servants, to see to the due execution of any contracts for works or materials, and of any works undertaken by the corporation, and to the carrying out of the said works under the direction of the said *Thomas Hawksley*."

"4. The said *Thomas Hawksley* shall, as soon as practicable after the date of the resolution directing any particular work to be constructed, and upon the requisite surveys and levels of the lands required for the same being furnished to him by the corporation, make and provide in duplicate such plans, designs, sections, detailed drawings, and specifications, and shall give such advice as to costs of works and otherwise as may be necessary and suitable for advantageously letting and carrying out the construction of such works by contract, or for enabling the corporation to undertake and carry out their construction; and one set of all such duplicate drawings, plans, designs, sections, and specifications, or any of them, or any part or parts of them (if the same shall be incomplete), shall be deemed to be the property of the corporation, and shall be delivered to the corporation, and the other set shall, subject to the provisions of these presents, be deemed to be and remain the property of the said *Thomas Hawksley*. The said drawings, plans, designs, sections, and specifications are to include all details which are necessary, and are usually supplied by the engineer to corporations, to enable them to enter into contracts, or to execute works themselves, or by contractors for works and materials under them."

"5. The said *George Frederick Deacon*, or other the engineer for the time being of the corporation to be appointed in his stead as hereinafter provided, shall take the general and constant supervision of the said works in consultation with the said *Thomas Hawksley*, and shall duly discharge all the duties usually performed by a resident engineer."

"In case the said *George Frederick Deacon*, or any engineer to be appointed in his stead as hereinafter mentioned, shall cease to be the engineer of the corporation for the performance of the duties to be performed by them respectively, as aforesaid, the corporation shall, as soon as practicable, appoint another engineer in his stead."

"The corporation shall, before making any such appointment, give fourteen days' notice thereof to the said *Thomas Hawksley*, and if he shall object to the fitness of the engineer proposed to be appointed, the question shall be referred, on the application of either party, to the president for the time being of the Institution of Civil Engineers as sole arbitrator (subject, so far as the same are applicable, to the provisions as to arbitration, hereinafter contained), whose decision shall be final and conclusive."

"6. The said *Thomas Hawksley* will do and perform, in relation to the said works, all things usual and proper to be done in relation to similar works by an *engineer-in-chief entrusted with the designing, superintendence and direction of such works*, and will exercise the due diligence and skill in all matters connected with the execution of the said works which are incidental to his position as *engineer-in-chief* and the practice of his profession in the designing, superintendence, and direction of the execution of such works as the corporation shall from time to time order to be constructed according to the plans, designs, and specifications thereof, subject to such alterations as the said *Thomas Hawksley* may from time to time deem necessary, and where important, as shall be approved by the corporation, and he shall use his best endeavors to get the several works executed and completed in a proper manner, and with due regard to economy and expedition."

"7. The said *Thomas Hawksley* shall, with such assistance of the said *George Frederick Deacon*, or other the engineer for the time being to be appointed in his stead as aforesaid, as he, the said *Thomas Hawksley*, is entitled to under these presents, report in writing to the corporation the progress and condition of the works from time to time if and when reasonably required by them so to do."

"8. All principal plans shall be subject to the approval of the corporation, and all specifications shall be subject to the like approval before such specifications are issued, but the approval by the corporation of such specifications, when not otherwise given, shall be considered to have been given by the acceptance by the corporation of any tender based upon them respectively."

"9. The said *Thomas Hawksley* shall advise the corporation and act as their *engineer-in-chief*, with such assistance of the said *George Frederick Deacon*, or other the engineer for the time being to be appointed in his stead as aforesaid, as he, the said *Thomas Hawksley*, is entitled to under these presents in the matters aforesaid, and shall, without any extra charge beyond the commission or percentage allowance hereinafter mentioned, attend to all matters within his department as *engineer-in-chief* of the said works during their progress to completion, and if any of the said works shall be let to contractors until the period during which such several contractors shall have agreed to maintain and uphold the same shall be fully completed, or until the expiration of one year after the works, if constructed by the corporation, have been brought into use, and the said *Thomas Hawksley* shall, when necessary, give his attendance pending any dispute with

any contractor or contractors employed as aforesaid, or in any action, suit, arbitration, or other legal proceedings with reference thereto, and attend whenever it may be necessary and when requested so to do the meetings of the Water Committee or Council of the Corporation for the purpose of personally informing them of and advising them on the matters which may arise from time to time during the progress of the works under this agreement."

Fourteen days later, March 16, an agreement was made with Mr. Deacon by the council, as it appears, through the efforts of the chairman, Mr. Bower, in which it was stipulated:

"And whereas it has been agreed that the said *George Frederick Deacon* shall continue in the service of the corporation until the completion of such reservoirs and other similar works as the corporation have determined or may hereafter determine to construct under the powers of the said act, and of the tunnels and first line of pipes from the Vyrnwy Reservoir to the Prescott Reservoir, and of the whole or so much of the filter-beds and other works connected therewith, and of so much of the second and third lines of pipes as may be constructed and laid simultaneously with the laying of the first line of pipes, upon the terms and conditions hereinafter contained—that is to say—"

"1. The said *George Frederick Deacon*, as *engineer in conjunction with the said Thomas Hawksley*, or in case the corporation shall appoint or employ another engineer in his stead, then in conjunction with such other engineer, shall continue in the service of the corporation until the first day of January or the first day of July, whichever shall first happen next after the delivery of water into the Prescott Reservoir, or in Liverpool, through and by means of the works hereinbefore mentioned, and shall during the whole of such period devote his whole time and attention to the duties of his office, and shall not directly or indirectly engage in any other business or employment whatever, or accept or undertake any office, duty, or service, except on behalf of a corporation or other local authority with the express recorded permission of the Water Committee on each occasion, and on the payment of expenses to the corporation as provided by the terms and conditions hereinafter mentioned, subject to any modifications which may be made by the corporation, in the said terms and conditions."

This agreement made with Mr. Deacon, though affecting Mr. Hawksley, Mr. Hawksley was not a party to, and for several years it appears he was ignorant of its details, though it is stated it was read in the Council meeting and made public in the Liverpool papers, and was referred to by Mr. Deacon in a letter to Mr. Hawksley, which letter, however, Mr. Hawksley never received for several years, as will appear further on. This letter, which explains how Mr. Deacon very naturally thought Mr. Hawksley was acquainted with the terms to which he objected so strenuously, was written September 15, 1881, and is as follows:

"Until the Liverpool Water Act of 1880 was passed, I had believed, and the belief was largely based upon the specific assurance of the then chairman, that the general understanding was, that if the powers were obtained I was to be appointed engineer for the carrying out of the works. Even as late as our visit to the Severn this was very distinctly stated. It never occurred to me that you sought the appointment, and this view was supported by what I thought a pointed reference of yours to the action of another eminent engineer under similar circumstances. Mr. Bower had asked me very shortly before the completion of the Parliamentary plans, in the considerate manner for which I always thank him, whether I did not think it desirable that you should sign those plans jointly with me. I thought it rather late in the day; but, on consideration of your position as a Parliamentary Engineer, I agreed that it was desirable to ask you to do so. Upon this being done, my position in the matter was obviously very materially changed in your sight, but hearty and mutual action being necessary for success, I endeavored to assist in producing it."

"Until the act was passed, and until after Mr. Bower's subsequent visit to you in London, not a whisper ever reached me of the proposal made in Paris that you and I should act even as *joint engineers* for the carrying out of the works. It came to me as a surprise and a disappointment. I believed then, however, that I saw the full extent of my position in relation to you, and when I saw also that the Water Committee desired the joint engineership to be established, I at once threw aside all previous expectations and endeavored to work up to the new position. At this point let me tell you how fully I appreciate, and how cordially I thank you for your repeated endeavors to make my pecuniary position under the corporation a better one; but I never could understand, and do not now understand, why the fact of my not being paid by commission should have made you wish to change the terms of the Paris agreement, and to make my position in the scheme still less important than you and Mr. Bower had arranged."

"Almost immediately before the execution of your agreement, you conceived a difficulty concerning the words 'joint engineers,' though I believe that all those representing the corporation intended that they should be retained. At the suggestion of Mr. Bower, I saw you on the subject in London; you shortly explained, though I failed to understand, the legal difficulty, and you declined

to reinsert the word 'joint,' but you said in effect, 'It will make no difference to you.' My reply, to the effect that it could not fail to make a difference if the alteration were known, was met by the reply, 'Oh, this will be stowed away and probably never seen again!' or by words of similar meaning. My desire for peace, possibly also my faith in human nature, and certainly my full belief that although the word 'joint' had not been inserted, we continued to be engineers for the scheme with equal responsibilities, induced me to avoid further collision with you in the matter. You may therefore imagine my utter astonishment, when one day shortly afterward in committee, in reference to a remark by some member concerning our joint engineership, the Town Clerk said: 'Mr. Hawksley has put himself down as Engineer-in-Chief.'

'Further comment is needless. I could not well, under the circumstances, have imported my own solicitor into the matter, but I had believed that, as I was still a paid official of the corporation, the Town Clerk would have seen that the agreed terms were carried out. In this I was wrong.'

'My own agreement with the corporation, however, appointing me engineer in conjunction with you, makes my position much better than your agreement taken alone leaves it.'

'The next point in your letter is that relating to the insertion of my name with yours on the plans and specifications. Your suggestion that this is done as a friendly thing I really cannot entertain. I believe my agreement makes it necessary. I never spoke to Mr. Bower on the subject until after he had seen you, when he assured me that the omission of the word 'joint' would make no difference in any other respect.'

'Pray remember, also, that I worked out this scheme from its inception, that my whole thought and attention are concentrated upon it, and that my position in connection with it is of the utmost importance to me, while it must be of comparatively little importance to you.'

Under these circumstances you cannot be surprised that I should tenaciously adhere to the position which I believe my agreement gives me.'

It appears in evidence that this letter was not mailed, but was intrusted to Mr. Charles Hawksley. It was not handed, however, to Mr. Thomas Hawksley, and four years after, when a copy was received by Mr. Thomas Hawksley, a search in the office revealed the fact that the original had lain unnoticed and unopened in a drawer in Mr. Hawksley's office. This circumstance explains how during these years Mr. Hawksley was in a constant state of irritation at what he assumed to be the unwarrantable interference of Mr. Deacon with his (Mr. H.'s) prerogatives and responsibilities. It also explains Mr. Deacon's not unnatural assumption of what he considered his "joint" responsibility.

After the signing of the contract the plans for the embankment were considered, and a stone embankment instead of an earth one as contemplated in the plans submitted to Parliament was decided upon. It appears from the correspondence that it was during the consideration of the details of the plans for this stone embankment that the first friction was caused. The following brief extracts from a voluminous correspondence will indicate the effect an attempted dual control produced. On August 16, 1881, Mr. Hawksley wrote:

'I think we ought now to be opening the quarries. We must accumulate a large quantity of stone, and, during the next summer, place it in position with great dispatch. I want to cover the rock upon which the great wall is to be founded as speedily as possible, because there is danger of the water acting under pressure washing the clay out of the beds and joints beneath the artificial work and then exerting a powerful uplift in addition to the horizontal pressure.'

Again, on November 30, 1882, Mr. Hawksley wrote to Mr. Bower:

'I suppose that nobody doubts that large stones *per se* are better than small ones so far as they are handleable and soundly bedable. I have not interposed otherwise than to point out that the wall must not stand on points or small areas or rapid inclines, as these will exaggerate the pressure and tend to split the superstructure, and that all loose and cracked and disturbed rock must be removed in order to prevent uplift insinuated under reservoir pressure.'

Mr. Bower then states that as the work progressed there was the usual discussion of the details of the work, which at the time led to letters and remarks from Mr. Hawksley of a complaining character with reference to Mr. Deacon, but that these were not of a serious nature and had reference "to Mr. Deacon's manner rather than to his acting detrimentally and to the success of the work." The following extracts, however, from letters of Mr. Hawksley indicate that he was more disturbed than Mr. Bower's statement would lead one to suppose. On November 3, 1881, he wrote to Mr. Bower:

'Mr. Deacon makes this huge mistake. He is not content to conduct the orchestra, but desires to perform a tune upon every instrument in the band, from the triangle upwards, and to write the music too.'

On February 18, 1882, Mr. Hawksley wrote to Mr. Bower:

"Either I am engineer-in-chief of this concern or I am not. If the latter, I know what to do. I enclose another letter which will indicate to you how I am interfered with and countervailed in all my efforts to do things for the best."

On February 27, 1882, Mr. Bower writes to Mr. Hawksley:

"I have had a long conversation with Mr. Deacon, telling him the impossibility of getting on well with our work unless there is a thorough understanding between you and him, and, also, that we cannot have the same work done twice over—viz., all exploring work as well as any other should only be undertaken on an understanding with you and to your approval."

March 1, 1883, Mr. Hawksley writes to Mr. Bower:

"Deacon wearies and worries me so much that all my labors are more than doubled. I really cannot carry, like Sinbad, a kind of Old Man of the Sea upon my distressed shoulders. He is not of the slightest use to me."

The following indicates some of the causes of Mr. Hawksley's dissatisfaction which induced him to express a desire to retire.

On August 5, 1884, Mr. Hawksley writes to Mr. Deacon—masonry:

"The stones are in their shape or shapelessness horrible. I cannot conceive how they are to be made to bear the pressure. They have neither top, bottom, nor side. I cannot call them *quarried* stones. They are really nothing more than the fragments of exploded masses; my ideas do not coincide with yours on the subject of compression. I believe that the concrete will yield more than the slate, and that consequently the irregular and in many cases insignificant surfaces of slate will have to do all the work of sustaining the weight and pressure."

On August 8, 1884, Mr. Hawksley again wrote to Mr. Deacon:

"I am afraid lest the wall should 'spelch,' or split. It is immaterial whether the shapelessness of the blocks is due to an explosive force or to a wedging force, or partly to one and partly to the other. The fact remains that the stones have no proper beds."

On November 28, 1884, Mr. Hawksley wrote to Mr. Bower:

"I feel in a very painful position with respect to the quality of the masonry of the great wall and apprehend serious results. I do not believe that any care in building will make safe and satisfactory work with stone so badly quarried."

Mr. Bower, in justification of the two conflicting agreements made with Mr. Hawksley and Mr. Deacon, offers the following by way of explanation:

"The desire of the Water Committee and of the council in entering into an agreement with Mr. Deacon was rightly that he should have an intelligent knowledge of the work as it was put in hand, and whether he was acting in *consultation* with Mr. Hawksley, as stated in Mr. Hawksley's agreement, or whether in *conjunction* with him, as in Mr. Deacon's agreement, that he should have time to consider what he was signing when specifications or drawings had to be signed, and what work he was superintending the carrying out of, in the practical execution of Mr. Hawksley's plans; and there can be no doubt that with mutual consideration on the part of each engineer, such a *role* could be carried out without trouble or friction of any kind."

That such "mutual consideration," however, was not sufficiently shown must be evident from the letters in evidence. From these letters we extract the following:

On September 10, 1881, Mr. Deacon returned a proof of a specification stating that he had not had time to carefully consider it, saying:

"Having regard to the responsibility which my agreement imposes upon me, I must ask you to be kind enough to give me much more time in future to examine the printed proofs. Indeed it would be much more satisfactory if, knowing the general scope of your proposals, we considered some of the details together before the type was set up."

On December 3, 1883, Mr. Hawksley wrote to Mr. Deacon:

"You have certainly overlooked the fact that I am the Engineer in Chief, and that consequently I ought to have been consulted with respect to any and all works of a permanent character proposed to be undertaken. Two kings cannot sit upon one throne."

Mr. Deacon replied to Mr. Hawksley on December 5, 1883:

"You have drawn my attention by the use of a term employed in your agreement, to the unfortunate difference between it and our mutual understanding come to immediately before its execution, as to what my position, notwithstanding it, was to be. I am doing, and shall continue to do, my utmost to avoid contention on this point. As I have often previously said, I am most anxious to confer

with you on all points, and to make everything in the progress of the works known to you. I have long felt that you suspect this not to be so, but in this you have certainly been mistaken.

"I desire not to raise further unnecessary difficulties, and in the views I now express I entirely rely upon our mutual understanding. I am ready almost at any time to meet you in London, either with respect to the works, or the plans and specifications in progress."

Mr. Hawksley, in justification of the position he assumed, calls attention to the clauses of his agreement, and in defense of a specification of September 12, 1881, wrote to Mr. Deacon:

"My specification contained the result of fifty years' dealings with both parties to a contract. Every decision of the courts is watched for and the specification adapted to it. Every claim and difficulty of a contractor is considered, and, if necessary, a new provision is introduced or an old provision is modified or omitted. In this way I have become the parent of specifications, and my specifications are pirated in every direction. I put into them everything that is really essential, and I keep out of them everything that is faddy or which places undue restriction on what ought to be the discretionary part of a contractor's business."

"I shall be glad to insert in the specification everything that is reasonable, but I do object to overload a specification with minute restrictions and directions to the destruction of the elasticity of action necessary to a contractor's operations. It requires as much judgment to know what to omit as to know what to insert."

We have quoted from this correspondence in order to give ample evidence of the trouble that resulted from the anomalous positions in which both Mr. Hawksley and Mr. Deacon were placed by the conflicting agreements made with these gentlemen apparently at the instance of Mr. Bower. After these years of friction matters culminated when, during a debate in the City Council about the cost of the dam, some reflection was made upon the engineer. This coming to the notice of Mr. Hawksley, he promptly tendered his resignation. The committee requested Mr. Bower, the chairman, to meet Mr. Hawksley and endeavor to induce him to withdraw his resignation. On the 1st of April, 1885, the Town Council passed a resolution to the effect that no reflections were intended to be made upon him, and instructed the Water Committee to ask him to withdraw his letter declining to act as engineer-in-chief. Mr. Bower was again requested to endeavor by personal interview to bring this about. He reports that Mr. Hawksley, however, declined to act until he could see a copy of the agreement made with Mr. Deacon which had been referred to in the debates to which Mr. Hawksley took exception. On the 2d of May, after having seen a copy of Mr. Deacon's agreement, he wrote to the Town Clerk, stating that he would—

"Be glad to withdraw his resignation after the obliging and gratifying resolution of the 1st of April but for the subsequent disclosures of the so-called dual control, and that under these circumstances he left his resignation still before the council."

It then appears that a large number of letters passed between Mr. Hawksley and the Town Clerk, in which Mr. Hawksley insists upon the acceptance of his resignation, and the Town Clerk, on behalf of the Water Committee, evaded the issue.

It also appears that the Water Committee, after vainly trying to induce Mr. Hawksley to act *in conjunction* with Mr. Deacon, or, in other words, divide the responsibility with him, rather than lose his services yielded his point, as would appear from a letter to him on July 13, 1885, in which the Town Clerk stated: "The committee, however, desire me to point out that although both agreements contain the expression 'joint engineer,' this is by way of recital, and with reference only to the application to Parliament." Also, "that Mr. Deacon will continue to take the general and constant supervision of the works in consultation with you, and to discharge all the duties usually performed by a resident engineer." Mr. Deacon also offered to relieve the corporation from so much of their agreement with him as would remove the points of conflict. All this, however, was without avail, Mr. Hawksley insisting on the acceptance of his resignation.

So far as appears, Mr. Hawksley has ceased to act in an official capacity as engineer-in-chief since September, 1885, and, so far as we are advised, he has not yet been officially relieved from his responsibilities as engineer-in-chief by the council.

We have been at considerable labor and pains to lay before our readers the history of this important controversy, and in quoting from the correspondence we have, to the

best of our ability, abstracted so much as would give an impartial idea of the merits of the case. At the same time we have also quoted statements which, it seems to us, are valuable, as they affected the consideration of the management of engineering undertakings. Indeed, it is this latter aspect of the case which has induced us to surrender so much of our space to what at first sight may have appeared to some of our readers as mainly a personal controversy over a question of personal dignity. Finally, in reviewing the evidence in the case, the following appear to be the conclusions that may properly be drawn therefrom:

First—That Mr. Bower, in behalf of the Water Committee, himself, and Mr. Deacon, undertook an impossible task when he assumed to demonstrate that so great an undertaking could be carried out in which there should be practically two engineers-in-chief.

Second—The making of an agreement with Mr. Deacon in terms that involved a condition which Mr. Hawksley had all along absolutely repudiated and which was inconsistent with the agreement made with him was a practice that could have no other result than that reached if Mr. Deacon, as he did do, assumed the prerogatives his agreement conferred.

Third—Both engineers are entitled to consideration for having been made the victims of an attempt on the part of an indiscreet and too zealous friend of Mr. Deacon, to force him into the position of a professional partnership in spite of the protest, and for a time without the knowledge of Mr. Hawksley.

Fourth—That whether Mr. Deacon's judgment was or was not well founded in his criticisms of Mr. Hawksley's plans and specifications, this had nothing to do with the merits of the case in view of the responsibility imposed on Mr. Hawksley by the agreement made with him. Yet, under the agreement made with Mr. Deacon, he was not without justification in asserting his right to be consulted about details in the plans and specifications.

Fifth—That Mr. Deacon's ambition to be the engineer-in-chief, or even the "joint engineer," of the undertaking in which he had done so much preliminary work, was perfectly natural. Yet since the Liverpool authorities were at the time unwilling to intrust him solely with the former responsibility, and Mr. Hawksley, whom they did intrust with that responsibility, was unwilling to divide it with him, his friends should have accepted the inevitable and not attempted by the agreement made with him to place him in an anomalous position and one incompatible with efficient working.

Sixth—Mr. Hawksley has laid down a rule of action which is the only proper one in view of the dignity of his position as engineer-in-chief, his responsibility in "reputation and purse," for the sufficiency of his plans and specifications, and the imperative demands of discipline and efficiency; namely, a chief-engineer should be chief-engineer in fact as well as in name, or he should retire from the undertaking.

Seventh—The cause of all the trouble was the mistaken assumption on the part of the Chairman of the Water Committee, that in such an undertaking the problem of efficient joint control was solely governed by the question of "mutual consideration on the part of each engineer"—conflicting agreements to the contrary notwithstanding.

In conclusion, we desire to place on record the fact that, in the quotations we have made, and the conclusions we have reached, we have not the slightest desire to in any way reflect on or question the ability of Mr. Deacon as an engineer, or in any way pass judgment upon the criticisms made upon him by Mr. Hawksley; our only object being to, if possible, teach commissioners in this country how impossible it is to conduct harmoniously and efficiently engineering undertakings with more than one engineer-in-chief, with all that that implies.—ED. SAN. ENG.]

SOME DETAILS OF DOMESTIC ENGINEERING IN THE POTTER BUILDING, NEW YORK CITY.

(Continued from page 34.)

THE tanks above the eleventh story, into which the well-water is pumped for closet and urinal purposes, also receive all the rain-water from the roof of the building. As the pressure from these tanks would be too great for the ball-cocks in the water-closet cisterns, intermediary tanks are used on the ninth, eighth, seventh, fifth, and third floors to reduce the pressure. The eleventh and tenth story water-closets and urinal-tanks are supplied direct from the upper tanks. The ninth-story cisterns and flushing-tanks are sup-

plied from a large intermediary tank near the ceiling, which in turn is supplied by ball-cock from the high tanks. The eighth-story intermediary tank is supplied directly from the house-pump by a separate pipe, and it overflows into the intermediary tank on the seventh floor, which in turn overflows into the fifth-story tank, which latter overflows into the third story tank, and then to the basement tank, the tell-tale pipe being connected with the latter so that when

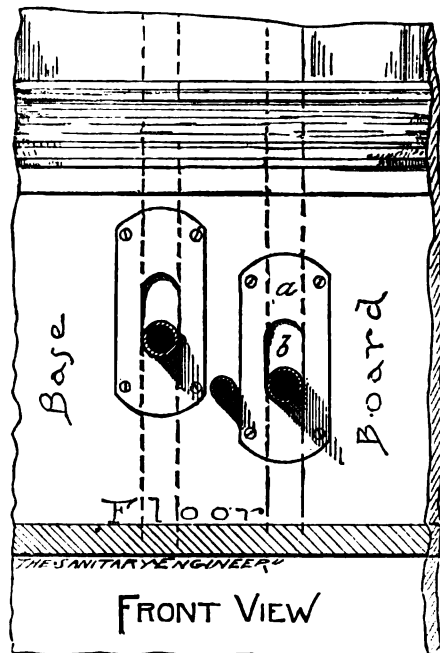


FIG. 2.

it shows water, all are filled. The tank on the seventh floor supplies that floor and the one below it, as do also the fifth and third story tanks the fourth and second stories respectively—the first or store floor having no closets.

In the building there are 56 water-closets and 37 urinals. The soil-pipe lines which run to the eleventh story are six inches their whole length, while those that run to the eighth story only are five inches. The ventilation-pipes are three

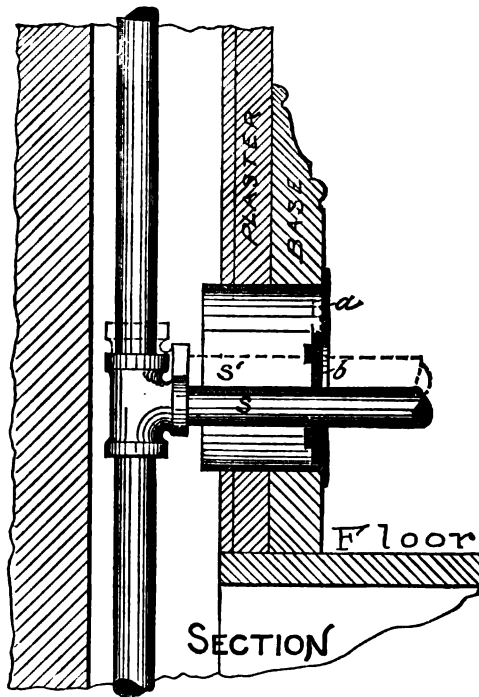


FIG. 3.

inches in diameter their whole length, with 2-inch back-air branches to traps, and a special feature of the ventilation-pipes is they have a "foot-vent"; in other words, air is admitted at the bottom of them so as to keep a circulation within them independent of what might pass from the soil-pipe and to secure less resistance to the passage of air to the traps on long lines for the purpose of anti-syphonage.

The basin-lines are three inches, with a 6-inch extension above the eleventh story, with 2-inch vent-pipe to the fifth-story fixtures and 1½-inch above, with air admitted below.

The heating of the building is by direct radiation; two 75-horse-power boilers and one 125-horse-power boiler are used. The latter is 70 inches in diameter by 16 feet long.

Arrangements are made to use the exhaust steam from the pumps and engines. Live steam is taken from the boilers through a 6-inch steam-pipe at high pressure, and reduced through a "Kieley" pressure-regulator to the desired back-pressure to be carried on the pumps, etc. This pipe joins with a large cylindrical separating tank, from which a 10-inch main goes to the house. A 7-inch main exhaust-pipe from all the pumps, etc., goes to the same cylinder. When the amount of exhaust steam is not sufficient for heating, and will not maintain the fixed pressure in the tank, the regulating-valve responds, and admits live steam until the pressure increases to the desired amount. All the return-pipes connect with this same tank or cylinder, within which a water-line is maintained, as all is below the boiler level, from which the water of condensation is pumped into the boilers by a "Blessing" pump-governor.

The rising lines are 146 feet long, 3 inches and 2½ inches in diameter at the bottom and 1¼ inches at the top. They are supported near their middle at the fifth floor within the recesses, and a special plate arrangement, designed by Messrs. Gillis & Geoghegan, shown in Figs. 2 and 3, has been used on the branches where they pass through base-boards or wainscotings. We believe it is technically called an "escutcheon," and is made of a face-piece, *a*, of cast iron, screwed to the base-board when it is to be of wood, but set with plaster of Paris when the base-board is of cement, and screws set

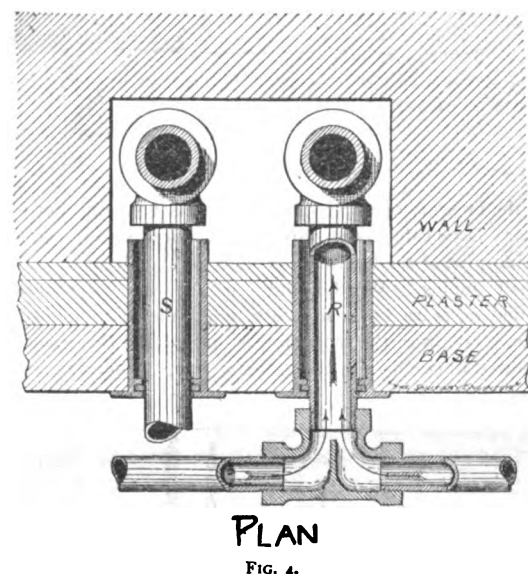


FIG. 4.

into lead fillets when of marble. It has a sheet-iron oval tube *s'*, which extends through the base and plaster, but the special point about it is the shutter *b*, which exactly fits the steam-pipe *S* and rises and falls with it, effectually covering the holes. Figure 4 shows the same in horizontal section.

Another special arrangement of fitting is shown in Fig. 4. It is a "partition" tee. It is used on the return-pipe when two radiators deliver their water into the same riser, and was made to obviate the backing of air or water into the opposing radiator. It was made at the instance of Mr. Edward Noonan, foreman in charge of the work, and can be fully understood by the illustration, Fig. 4, which is a horizontal section and plan through a "riser-recess" of the building, *S* being the steam-pipe, and *R* the return-pipe.

Four of the Otis hydraulic elevators are used in the building. Although the pressure from the open-tank system in this building is, presumably, as great as in any in the city, the makers use a compressed air-pressure of about fifteen pounds in addition.

This arrangement is shown in Fig. 5. The static head of the column of water from the surface of the water in the tank to the cellar is about 85 pounds per square inch. To this is added about fifteen pounds air-pressure so long as the tank is kept at its normal level, or, in other words, so long as the air is kept at that compression by the water being forced into the tank. This air, of course, is available for power only under compression, and should the pumps be stopped for a short time, and water drawn from the tank until the air was expanded to the pressure of one atmosphere only, then the water remaining in the tank would be available in a less ratio of pressure than that due to the head of water, as the air would become rarefied. To obviate this Mr. Q. N. Evans, an engineer of the Otis Company, designed the arrangement shown in Fig. 5. A safety-valve, *s*, is applied, made of a cup and a rubber ball-valve. This opens toward the tank, but, nevertheless, operates both

ways by the attached levers and float, so as to admit or let out air, so as to keep the supply constant. This is done by the float holding the valve open until the water reaches the height where compression should commence, and the slack chain allowing the ball to act as a vacuum-valve.

Figures 6 and 7 show an ingenious and simple contrivance devised by the same person for the purpose of preventing the starting of the elevator-car by the operator should the water in the upper tank become low. The chain *b'*, Fig. 5, is a continuation of the chain *b*, Fig. 6. When the water in the tank goes below what the slack of the chain is provided for, the pawl shown in elevation and plan in Fig. 7 is brought above a "slop" on the hand-rope, locking it until the tank is pumped up again. One of the elevators is arranged for hoisting safes. In this case,

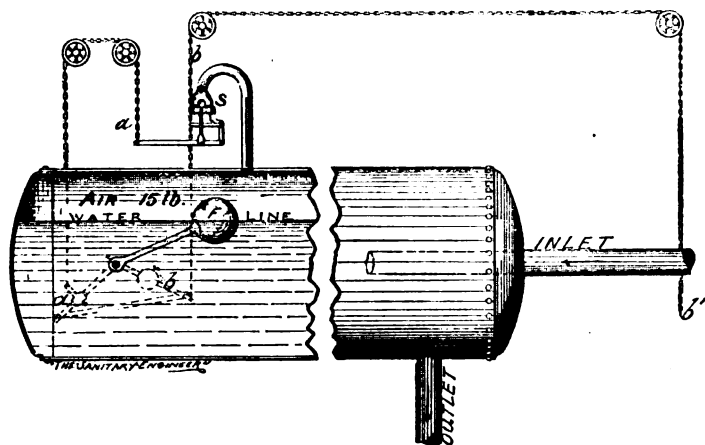


FIG. 5.

as the pressure of water from the tank is not sufficient for a very large safe, a stop-valve is introduced into the circulating-pipe of the hydraulic cylinder of the elevator, and a small duplex "Worthington" pump, with large steam-cylinders, is used to pump directly into the hydraulic cylinder. To lower, the stop-valve is opened and the water is allowed to circulate in the ordinary way, the surplus water finding its way into the lower tank.

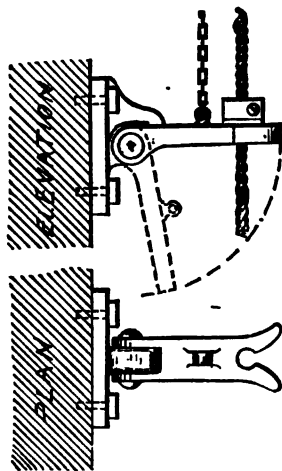


FIG. 7.

The architect of the building was the late N. G. Starkweather, whose superintendent and assistant was Mr. A. Belland.

The steam-fitters were Messrs. Gillis & Geoghegan, and the plumber the late M. J. Dunn, all of New York.

We are indebted to Mr. Wesley Randel, the engineer of the building, for information to enable us to prepare this description.

Correspondence.

SCHOOL ARCHITECTURE, HEATING AND VENTILATION.

WHITESBORO, TEX., June 9, 1886.

SIR: I have recently been informed that you published in THE SANITARY ENGINEER a letter that Mr. John T. Dickinson, of Austin, wrote you in reference to the department of "school architecture, also heating and ventilating apparatus." This is a department in our educational exhibit in connection with the State Teachers' Association. This enterprise is an experiment, so that we are anxious to make it a success.

As superintendent of the above-named department, I am very grateful to you for the publicity you have given our enterprise, and hope through your timely aid I may be able to secure some valuable contributions to my special department.

If you will be so kind, you may insert in the columns of your valuable paper that the State Teachers' Association of Texas will convene in Representative Hall, in the city of Austin, June 29, and that the committee-rooms and other rooms of the building as far as needed will be used for the educational exhibit.

The exhibit will be free and any contributions that any firm may make that will be of practical value to our teachers and that may bring such goods into requisition as would be most approved in "school architecture, heating,

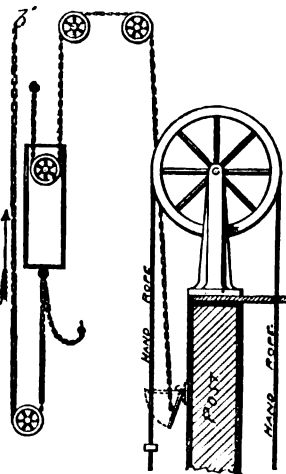


FIG. 6.

and ventilating." Plans, specifications, and samples are all desirable, will be very gratefully received, and cared for during the exhibition, then remain subject to the orders of the contributor when exhibit is over.

Mr. Jacob Bickler is Chairman of Committee of Arrangements, to whose care articles can be sent. Please send articles at once. Very respectfully,

MISS ELIZABETH MARCH.

PROGRESS OF THE PHILADELPHIA PLUMBING INSPECTION.

(From our Regular Correspondent.)

PHILADELPHIA, June 11, 1886.

SLOWLY, but apparently surely, are the movements forward toward perfection and full operation of the plumbing laws of the city promulgated by the Health Board. It has been impossible for months past for the friends of the measure, in the board and out of it, to have the Finance Committee even consider the appropriation asked for by the board to set the department in operation and pay the salaries of the necessary inspectors, and this tardiness so goaded the board in its earnest endeavor to carry out the direct statutory instruction of the Legislature, that it about determined to appoint the inspectors and then mandamus councils to appropriate sufficient money afterward. Accordingly the competitive examination was held and a chief and six inspectors appointed, and the action reported to councils. This action seemed to stir the councilmen to a sense of necessity for some action, for at the meeting of the Finance Committee, on Monday, June 7, the appropriation was taken up for consideration as well as the board's communication in reference to the salaries suggested by that body.

A very lengthy discussion was had on the proposed inspectorship and the kind of men necessary, and, finally, it was agreed to report the ordinance to councils, recommending the appointment of one chief inspector at \$1,300 per year, and four inspectors at \$1,000 per year each, and a clerk at \$1,000.

The board has placed three of the inspectors chosen by their body at work under the chief inspector, and they are now hard at work trying to cover those portions of the city where the most building operations are being performed, and, although every effort is being made to do so, the futility of attempting to fully inspect the plumbing-work of a city where there are 800 square miles of streets and with over 460 registered master plumbers with a force even much larger than that now at work is extremely apparent.

The necessity for the new department is also very evident from the work found by the inspectors in some of the sections of the city, cases being found in a few instances

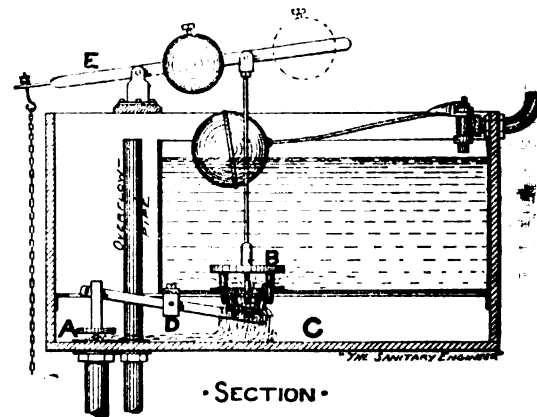
in which although plans were presented at the department and approved, as in conformity with the regulations, the work has been done in a manner not according to the plans and in direct opposition to the rules. In a few cases the work has been ordered done over, and in one large building the entire plumbing was overhauled. Numbers of plans have been presented that approval has been withheld from, and in several cases where the specifications had been prepared by some of our so-called best architects they displayed an ignorance of sanitary requirements that was truly surprising.

Novelties.

Under this heading we propose to describe and illustrate appliances of probable interest to our several classes of readers. The selection will be made without reference to the wishes of agents or patentees, being governed solely by considerations of novelty, ingenuity, and probable interest to readers, and especially the fact that they have not been elsewhere described. As a rule we shall make no comments, and it is to be distinctly understood that a notice does not imply approval. No charge will be made for these notices, and any offer of pay for their insertion will insure their omission. We shall be glad to have our attention called to novelties suitable for this section.

FLUSHING-CISTERN.

We illustrate what is called the "Novelty" cistern, to be used in connection with a seat attachment for flushing water-closets. It is the invention of Mr. J. E. Boyle, and is manufactured by Henry Huber & Co., of 85 Beekman St., New York City. It is designed to give a preliminary and after wash. When at rest the service-box is empty, the valve A being lifted by the depression of the lever C, on which a pin passing through the valve B rests. When the



seat of the closet is depressed, pulling down the weighted lever E, the valve B is lifted, and the water passes into the service-box. A portion of this escapes through A, thus giving the preliminary flush. The surplus flow of water into the service-box soon closes this valve by overweighting the lever which suspends it, and the service-box fills. When the lever E is released the valve B closes, pressing on the lever C and opening the valve A, when the contents of the service-box are discharged.

CINCINNATI INDUSTRIAL EXPOSITION.

A NEW series of exhibitions of art and industry will be inaugurated in Cincinnati, beginning September 1 and closing October 9. These are managed for and in behalf of the citizens of Cincinnati, who guarantee expenses by subscribing to an ample fund, by a board of commissioners, fifteen in number, chosen equally from the Mechanics' Institute, Board of Trade, and Chamber of Commerce. Their services are entirely gratuitous. The marked success of the Cincinnati exhibitions is due to their management. There are no stockholders, no dividends are declared, and no private interests are subserved. The last, or twelfth exposition, had exhibitors from twenty-nine States and four Territories, from several foreign countries, and was attended by 327,000 visitors. The exhibition of machinery in motion and the display of useful and artistic articles for purposes of construction will continue to be features. The Government, as usual, will maintain a post-office in the buildings, and ample accommodation is offered to intending exhibitors. Mr. L. H. McCammon is secretary.

BUILDING WATER-WORKS ON THE "INSTALLMENT PLAN."

OUR series of descriptions of recent water-works construction has brought us a letter, which we have read with some amusement, describing the processes by which a New England village, after a series of years, secured a public water-supply. It seems practically to have been on the "installment" plan.

The town of Easthampton, Mass., with a population of about 5,000, some fifteen years ago purchased of the Valley Machine Company, of that town, one of their bucket-plunger steam-pumps of a capacity of 400 gallons per minute, and laid that year 1,000 feet of 6-inch pipe through one of its principal streets, placing four hydrants along the line of this pipe. The pump was located at the works of the company which built it, the town agreeing to pay them \$2.50 per hour for the actual time the pump was run in case of fire. The cost for the first year for pipe-laying, pump and care of and running the same was about \$2,000. The next year an additional thousand feet of pipe was laid at a cost of \$1,000. The third year another thousand dollars was expended for pipe and hydrants. This brought the pipe past the front of the hotel of the town. The landlord applied to the Selectmen and engineers for the privilege of tapping this pipe and running a 1¼-inch pipe into his building, with ball-cock, etc., to supply his tank, putting a small steam-pump near the fire-pump and thus supplying himself with water. He argued that, as the town would be benefited by having the pipes filled in case of fire, he should not pay anything beyond the cost of running his own small steam-pump. This proposition was accepted. As the neighbors found that no trouble ensued from the hotel being supplied, they one by one applied for water, agreeing to share the expense with the hotel landlord in running the small pump. When the demand for water was beyond the capacity of the small steam-pump to furnish, the town decided to undertake the matter of supplying water for domestic as well as fire purposes; and subsequently a larger pump was secured, at a cost of \$500 per annum, to supply water for domestic and fire purposes, in addition to the regular fire-pump.

The pumping is done directly into the pipe, and the pressure in the pipes is from 80 to 100 pounds per square inch. The two pumps, although in different locations, are on the same level, and safety-valves on the water-pipes are set at 125 pounds, this pressure being sufficient for good fire-streams in any part of the town. There are now about five miles of pipe (4-inch and 6-inch) and about fifty hydrants. The largest sum expended in any one year was the first year, when the fire-pump was purchased.

We give the foregoing account of this method of securing water-works, not because we advocate this installment plan of securing what every town so imperatively needs, but because it is interesting as showing how a conservative community was educated up to the importance of possessing what at that period (fifteen years ago) was not so generally appreciated as it is to-day.

COMPLAINTS having been made that a powder company whose works are near Lake Hopatcong, New Jersey, were discharging acids into the lake and polluting its waters, the president of the company states that measures have been taken to prevent any escape of impurities into the lake, and that the company is "proud of its share of benefit to the locality," and is anxious to secure the impossibility of injury to the waters of the lake.

It is proposed in Salt Lake City, Utah, to build additional reservoirs higher up in the cañon whence the water-supply is derived, to furnish water to a plateau in the city which is now termed the "dry bench." A stand-pipe four feet in diameter and fifty feet high is also proposed, to which water will be led by a pipe laid still further up the cañon. The superintendent favors the use of wooden pipes for distribution.

In Dawson County, Tex., borings made by direction of some capitalists who sought information as to the possibility of obtaining underground water, showed that at a depth of 60 to 80 feet there is to be had a copious supply of good water, which can be raised by deep-well pumps driven by windmills.

[TOO LATE FOR CLASSIFICATION.]

CONSTRUCTION NOTE.

(By telegraph to THE SANITARY ENGINEER.)

PHILADELPHIA, June 15, 1886.

THE following bids were opened at the Water Department for one 20,000-gallon pumping-engine and foundations, or for two 10,000-gallon pumping-engines and foundations: For the first the bids were—Holly Manufacturing Company, \$69,000; Gordon & Maxwell Company, \$85,500, and also \$88,500; W. Cramp & Sons, \$72,330; R. Wetherill & Co., \$67,000; and H. R. Worthington, \$57,000. For the two 10,000-gallon engines, Gordon & Maxwell Co., \$42,500 and \$40,000; W. Cramp & Sons, \$81,140 (for both); R. Wetherill & Co., \$74,500 (for both); H. R. Worthington, \$71,500 (for both); and T. P. Morris & Co., \$87,900 (for both). All bids referred.

Gas and Electricity.

Illuminating Power of Gas in New York City.

Week ending	New York Gas-Light Company.	Manhattan Gas-Light Company.	Metropolitan Gas-Light Company.	Mutual Gas-Light Company.	Municipal Gas-Light Company.	Krickerbocker Gas-Light Company.	Equitable Gas-Light Company.
June 5.....	26.05	18.85	21.82	31.04	30.11	23.78	32.49
June 12.....	25.22	19.32	22.30	29.73	29.55	23.69	33.06

E. G. LOVE, Ph.D., *Gas Examiner.*

TO PREVENT ACCIDENTS IN MINES.

A RECENT number of the *Journal of the Society of Arts* contains some abstracts from the final report of Her Majesty's Commissioners appointed to inquire into accidents in mines.

The report calls attention to the importance of examining all mines by means of indicators capable of detecting as small a proportion as one per cent. of gas, such examination to be made before the commencement of each day-shift. The use of safety-lamps is recommended in all dry mines where the air may contain coal-dust, or where fire-damp is known or suspected to exist. Referring to the different safety-lamps, the commissioners state that the ordinary Davy lamp becomes unsafe before a velocity of 400 feet per minute is attained. The ordinary Clanny lamp will almost certainly cause an explosion in a current having a velocity of 600 feet per minute, while the Stephenson lamp will frequently cause an explosion in a current of 800 feet per minute. Currents with velocities of over 400 feet per minute are frequently found, and those approaching 2,000 feet are on record.

Four lamps are mentioned as combining a high degree of security with fair illuminating power and simplicity of construction. They are Gray's lamp, Marsant's lamp, the bonneted Mueseler lamp, and Evan Thomas's modification of the bonneted Clanny lamp. The best results were obtained with the last-mentioned lamp.

The commissioners favor the use of glow-lamps as auxiliary lights, but say that as they do not afford any indication of the condition of the atmosphere in a mine, their employment, even if special fire-damp detectors are used, cannot in any case dispense with the necessity for the use of some safety-lamps.

THE output of coal in the United Kingdom in 1885 was 159,351,418 tons, in which 520,632 colliers were engaged.

A SYNDICATE of Chicago capitalists has applied for an exclusive franchise to lay mains in the streets of Appleton, Wis., for supplying natural gas from a well which it is proposed to sink.

CONTRACTS for lighting the streets of Camden, N. J., have been awarded to the Camden Gas-Light Company at \$25 per gas lamp per year, and to the Pennsylvania Globe Light Company at \$22 per gasoline lamp.

A COMPANY, known as the Gas Consumers' Company, has filed articles of incorporation at Albany. The purpose is to furnish gas in New York at \$1 per 1,000 cubic feet. Among the incorporators are: John H. Sherwood, President of the Gas Consumers' Association, Russell Sage, and Henry Hilton.

THE Gas Consumers' Association of New York has obtained from the Attorney-General of the State an order requiring the Consolidated Gas Company to appear at Albany on the 22d inst., in answer to an application for the appointment of a receiver and the winding up of its affairs. The ground alleged is irregularity in the passage of the act authorizing the consolidation.

THE Imperial Continental Gas Association recently held its half-yearly meeting in London. The association has a capital of about \$14,000,000, with works at Amsterdam, Rotterdam, Antwerp, Brussels, Berlin, Hanover, Vienna, and other places. The report of the directors states that the quantity of gas made in the half year ending December 31, 1885, was 3,694,000,000 feet—an increase of about 6 per cent. over the corresponding period of 1884. There were 122,243 consumers on the books of the association, and the entire length of mains laid was 1,547 miles.

THE *Elektrotech. Zeitschrift* of April, 1886, says that lately the Brothers Siemens have been manufacturing glow-lamps, whose glasses are filled with hydrogen. It had been remarked before that glow-lamps in which the inner glass wall had been rendered brown could be cleaned by filling them with hydrogen and then exposing both the carbon filament and glass to a high temperature. These lamps are said never to become brown at all, and to last longer. They can be used with higher electro-motive forces, and consequently under conditions considerably more favorable to economy, without diminishing their wear. It is thought that many evils which are found in the vacuum glow-lamps now in use will disappear when the carbon filament is in an atmosphere of a gas exerting considerable pressure, but not acting chemically upon it.—*Electrician.*

NOTES.

IN Montreal, Can., the cost of repairing main sewers in 1885 was \$10,589.24, according to the report of Superintendent St. George, of the Street Department. The repairs of old and defective lateral sewers cost \$3,584.27, the construction of catch-basins \$9,791.68, and the construction of 16,428 feet of lateral sewers \$40,140.68. Mr. St. George advocates the construction of an intercepting sewer to take the drainage of 3,030 acres and discharge it into the river directly, without passing through the low-level system, where the sewage in flood times has to be pumped.

AN epidemic of typhoid fever is prevailing at Bellaire, O., due, it is supposed, to a pollution of the river-water by the sewage of Wheeling, W. Va.

THE first examination of candidates for the offices of Municipal Engineers and Surveyors, under the auspices of the London, Eng., Municipal and Sanitary Engineers, was held at the Institution of Civil Engineers. The examination was *viva voce* and written, the examiners being Messrs. R. Vawser, M. I. C. E., (President); W. G. Laws, M. I. C. E., City Engineer of Newcastle-on-Tyne; Clement Dunscombe, M. A. M. Inst. C. E., City Engineer of Liverpool, and Ellice Clark, of Hove. Nineteen candidates presented themselves, and certificates were granted to the following: J. A. Angell, of Leytonstone; H. Ashmead, Clifton; H. G. Coales, King's Lynn; W. C. Fenton, Sheffield; A. D. Greatorex, Toxteth Park; A. Harland, Charlotte Street, London, W.; F. Osborne, Dover; C. E. Saunders, Walthamston; J. W. Witts, Skelton-in-Cleveland.

DAVID VAN NOSTRAND.

THE death of David Van Nostrand, one of the most widely known American publishers of scientific books, occurred on Monday, in this city, in his seventy-fifth year. From the age of fifteen he had been almost constantly connected with the book-selling and book-publishing business. His first partnership was with William B. Dwight, which was dissolved in 1837. Some years after he opened a book store at Broadway and John Street, in this city, and, finally, entered upon the special line of the publication of scientific books, removing, in 1869, to Murray Street, the present location. Mr. Van Nostrand leaves a widow but no children.

THE last stage of a case in which summary action was taken by the local sanitary authority, reflecting credit on on the local board at Coventry, Eng., and its Sanitary Inspector, Mr. Booker, has just been reached. The inspector having reported that certain closet accommodation on the premises of a Mr. T. Beech was a nuisance, the said Mr. Beech had notice to abate the nuisance, substituting water-closets with proper flushing-apparatus for the old privies. Failing attention on the part of Mr. Beech, the sanitary authority took the matter in hand, did the work, and, under Section 36 of the Public Health Act, took summary action to recover cost of same—some £21 (\$100.80). Beech appealed to the Local Government Board against this step, and an inquiry under a Government inspector was held, the appellant's position being that he was not liable for the sum, he having an objection to water-closets, and holding that earth-closets would have been efficient and should have been used. The local authorities' contention was that water-closets were the proper things in this instance, and the ruling of the Local Government Board has upheld the view of the local authority. Common sense should dictate to Mr. Beech that if every one were permitted to carry out his own "crank" in sanitary matters, overruling the powers of the various local boards, the work of such boards would be simply impossible to carry through.

THE SANITARY ENGINEER.

DEVOTED TO

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ZINC IN DRINKING-WATER.

THE London *Lancet* of April 24 contains an account by Dr. John Ward of an outbreak of colic on a steamship which he attributes to contamination of the water-supply by zinc derived from zinc plates fixed in the boiler from which this water was condensed. It appears that the intention had been to renew the water-supply of the ship at Batavia, but that this was not done from fear that the water at that port was contaminated by cholera contagium, and the supply for the remainder of the voyage was obtained by the distillation of sea-water. On testing the water it was found to contain zinc.

This brings up the questions, which have been frequently asked and never definitely and satisfactorily answered, as to whether the compounds of zinc taken up from the surface of that metal by drinking-water can be of such a character and quantity as to make the use of the water dangerous to health or life, and as to the circumstances under which such dangerous contamination may occur.

The matter has been several times investigated, chiefly with reference to the possible risks of the use of zinc-lined cisterns, or of galvanized-iron pipe, and the result has been the declaration by chemists and sanitarians that these risks are very small. An elaborate paper on this subject by Dr. W. E. Boardman, of Boston, was printed in the fifth annual report of the State Board of Health of Massachusetts for the year 1873, and in THE SANITARY ENGINEER, Vol. V., page 476, is given a communication from Professor William Ripley Nichols on the same point.

Zinc is taken up by water from galvanized-iron pipes, sometimes very rapidly, and in any case the zinc coating is often removed in the course of a few years. The zinc forms an oxide, and then, with ordinary waters, a carbonate. These are not very soluble in water, and tend to form a protective coating in the metal, but are easily detached by a strong current and pass out held in suspension sometimes in such amount as to give a milky tinge to the water. But the oxide and carbonate are not usually reckoned as poisonous. The oxide has been repeatedly given in doses of twenty grains a day, continued for a month or more, without producing any particular effect. The poisonous salts of zinc are the chloride and the sulphate, but we do not know of any case in which these have been found in drinking-water in quantity sufficient to produce deleterious effects.

Water drawn from galvanized-iron pipes has been suspected of producing disease, but in these cases it seems very likely that the water would have done the same if taken before it entered the pipes. It is possible that the impurities of some zinc rather than the zinc itself have produced trouble, and this seems the most probable explanation of the epidemic of colic reported by Dr. Ward. If the zinc plates placed in the boilers contained a considerable quantity of lead, which is quickly attacked by distilled water, the colic is not surprising.

FORESTS AS SANITARY AGENTS.

IN the progress of the increase of population in a country, more especially under those circumstances which, taken in the aggregate, we call civilization, there must be more or less interference with natural surface topography. Man is a great disturber of things, and, unfortunately, the changes which he brings about are not always for the better. Among these changes, some of the most important, both in their immediate and in their remote results, are those connected with the destruction of the forests with which large portions of the earth now comparatively or entirely bare of trees were once covered. As population increases, the need of food-supply requires that forests shall give way for agricultural purposes, and a certain amount of destruction is therefore inevitable; but no one who is familiar with the process of stripping the hills and valleys of their natural growth of trees, which has been going on with an accelerating ratio in this country during the present century, can doubt that much of this has been unnecessary, that we have been prodigally wasting our inheritance, and that it is high time that steps were taken, not only to prevent further unnecessary destruction, but also, by systematic planting, to repair some of the damage which has been already done.

The presence of forests modifies the climate in their immediate vicinity, tending to prevent extremes of temperature, and often of moisture, and in this manner they may affect the character and severity of the diseases of a particular locality. They protect from violent winds, and, to some extent, from malarial influences.

Their influence upon temperature is to prevent wide variations between day and night, such as occur upon desert and arid plains; they store heat during the day and radiate it slowly at night.

But it is not only to localities in their own immediate vicinity that forests are important. Their value is perhaps even greater to distant regions, the water-supply of which they regulate and control. This regulation is effected, not so much by any great influence exerted by them upon the total amount of rainfall in their vicinity, or by any effect which they produce upon the total annual evaporation from the surface which they cover, as it is by the fact that they tend to form, by their roots, the plants which flourish in their shade, and the collection of dead leaves, etc.—a sort of huge sponge which retains for a time the water falling upon it, and afterward gives it off gradually, supplying springs and streams. In this way they tend to prevent great variations in the size of streams flowing from them, and thus to avert floods and droughts; they are the regulators of the water-supply of distant places lying at lower levels in the drainage areas in which they flourish.

In view of these facts, it is evidently important that those parts of the country where culture is either impossible or unprofitable shall be devoted to trees, that a watchful care should be exercised over these regions to prevent unnecessary and

useless destruction of the timber by fires, etc., and that the systematic planting of trees to replace those taken for manufacturing purposes should be encouraged as far as possible. This planting of trees must in fact become in this country a commercial necessity at no very distant day, for the prices of the lumber needed for our houses, furniture, and for the transportation of goods will before long rise to such a point as to make tree culture a profitable and essential branch of industry.

OUR BRITISH CORRESPONDENCE.

The Norwood Sewage-Farm Inquiry—The Native Guano Company Patent Infringement Suit—Tall Chimney at the Mechernicht Lead-Works.

LONDON, June 5, 1886.

AN inquiry now being held by a Government Inspector on the projected extension of the Norwood Sewage-Farm is an opposite comment upon the address of Dr. Carpenter

solids from the liquid, which then run on to the land, filtering over and through (sometimes) five fields before the effluent runs away. The solids left behind in the screen or filter-house are dug out, and, after being mixed with ashes, are used for manuring fields for the mangold crops. That portion of Mr. Figg's evidence referring to the cemetery adjacent to the farm should receive attention at the hands of the borough authorities. He stated that the cemetery superintendent's house drains into a cesspool, such cesspool being in communication with the water-course running along the farm by a drain. Referring to the common graves at the lower end of the cemetery, he stated that they were often left open from six weeks to two months waiting for a second interment; that in the interval they become full of water, which had to be pumped out into the water-course, and that the smell of this liquid was strong and offensive. Apart from other considerations, the facts, if they are as stated, are a gross offense against common decency, and an unnecessary and cruel want of consideration toward the feelings of the relatives of the dead, who are of the pauper class.

but that in the town and immediate suburbs they will not look at it. Sweepings of cattle-trains, etc., are sold there at 2s. (48 cents) a ton, and slaughter-house sweepings, manure offal, etc., apart from blood, fetches about the same.

There has recently been completed at the Mechernicht Lead-Works (Germany) a chimney-shaft the height of which is probably unequaled in the world. Taking into account the eleven feet of substructure, the total height over all is 440 feet. The base is thirty-four feet square to a height of about thirty-four feet, where the shaft changes to octagonal, thence to circular, tapering to 11½ feet. The flue graduates from 11½ feet at bottom to ten feet at top.

SAFETY-VALVE.

OUR SPECIAL ILLUSTRATION.

A RESIDENCE AT BEVERLY FARMS, MASS.—HARTWELL & RICHARDSON, ARCHITECTS.

THE country house of which we give two views this week is the residence of Thomas E. Procter, Esq., at Beverly

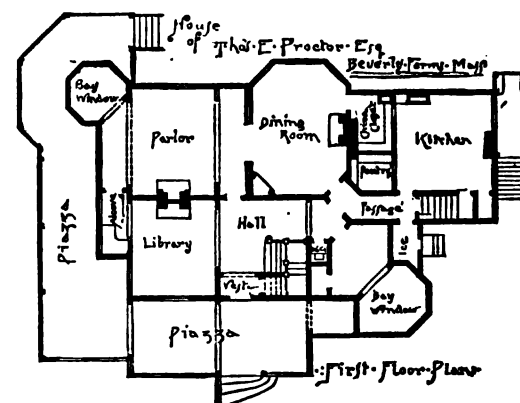


A COTTAGE AT BRYN-MAWR, PA.—FURNESS & EVANS, ARCHITECTS.

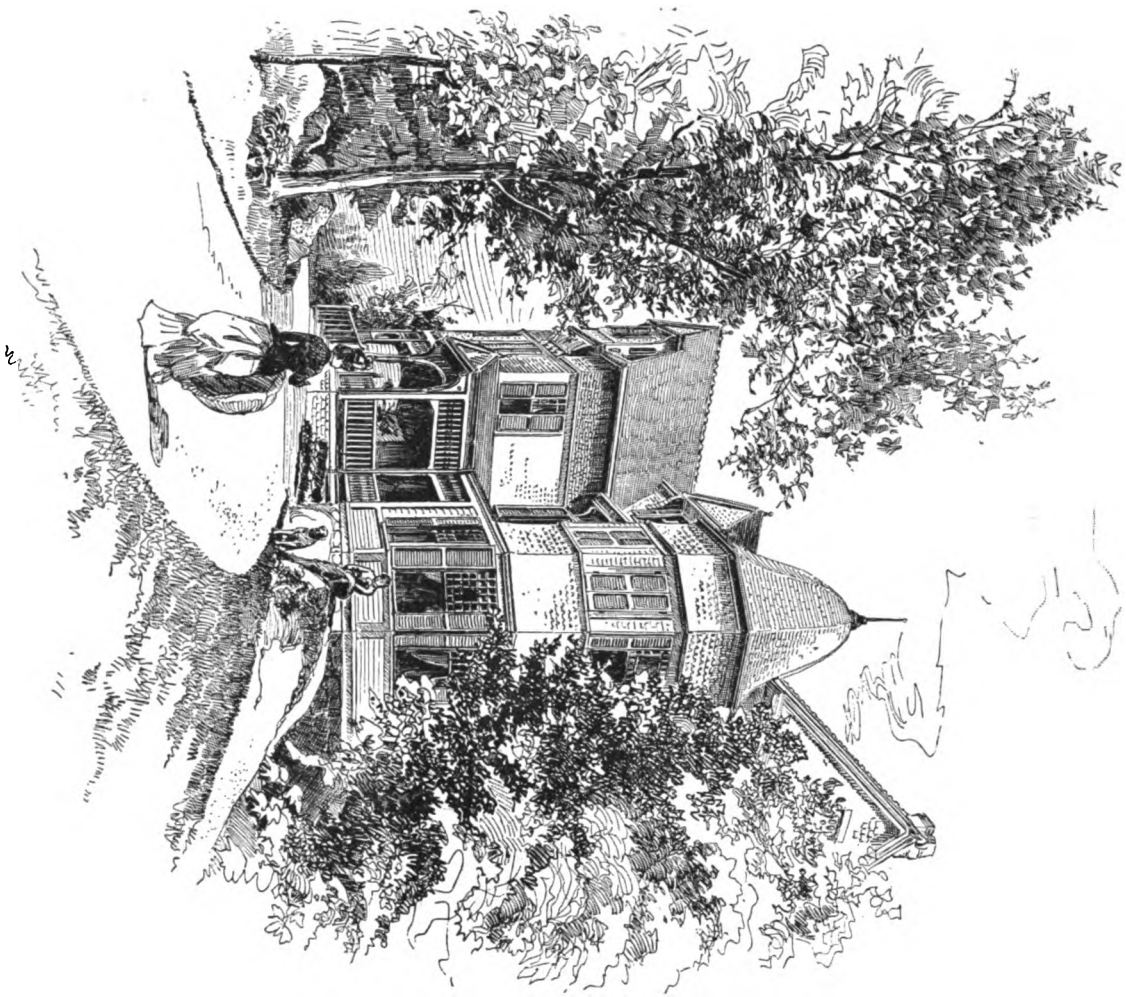
to the Association of Sanitary Inspectors. The Croydon Corporation are desirous of obtaining Parliamentary powers for raising a loan of £47,593 (\$228,446.40) for the purpose of acquiring further land to extend their Norwood Farm. A great number of the inhabitants of the neighborhood are offering the most strenuous opposition, on the grounds that the present farm is already a nuisance and injurious to health, and that its extension will, of course, increase this nuisance. Mr. Walker, the Borough Engineer, in his evidence, stated his opinion that the land now proposed to be purchased would be sufficient at least for twenty years, and that if then sold it would fetch more than its present value. He showed that the alternative scheme most favored—namely, the connection with the West Kent scheme of sewerage—would entail large increased cost on the rate-payers, and denied the existence of the alleged existing nuisance, which would, of course, be the only justification for incurring the extra expenditure. The farm manager, Mr. Figg, in his evidence, stated that the chief flow of sewage was from 10 A. M. to 2 P. M. The process of using the sewage he stated as follows: It is received on the farm through a screen, which separates the

Judging from the fact that a case has just been heard before Vice-Chancellor Bacon, in which it was sought to restrain the defendants from making and offering for sale manure made from town sewage under the name of "native guano," it would appear that the trade in such manure is acquiring additional monetary value. Hitherto it has hardly been looked upon as very lucrative business. The plaintiffs were the Native Guano Company, Limited, the patentees and proprietors of the A. B. C. system of sewage disposal, the main feature of which is, of course, the rendering of the sewage into a serviceable form for use as manure. The defendants, trading as the Sewage Manure Company, advertised and circularized an article of their own manufacture as "the native guano and soot manure." The Vice-Chancellor granted the injunction asked for. The plaintiff-company stated that they had expended upward of £160,000 (\$768,000) in the acquisition of the patents. They have unquestionably fought an uphill fight with great determination, and seem to be entitled to the protection of their trade-mark name. In this connection I may say that the Borough Engineer of Belfast states that the farmers up-country will use this form of manure readily,

Farms, Mass. It is not a new house, but was enlarged and reconstructed at a cost of about \$22,000, from designs



by Messrs. H. W. Hartwell and William C. Richardson, architects, of Boston.



THE SANITARY ENGINEER ILLUSTRATED SERIES.

A RESIDENCE AT BEVERLY FARMS, MASS.

HARTWELL & RICHARDSON, ARCHITECTS.

THE SANITARY ENGINEER.

DEVOTED TO

ENGINEERING, ARCHITECTURE, CONSTRUCTION, SANITATION.

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SEWAGE UTILIZATION AND FARMING AT PULLMAN.

At a recent meeting of the Society of Arts, Dr. C. M. Tidy delivered an address on the "Treatment of Sewage," in which he took the ground that it was "incompatible to combine any treatment of sewage with both sanitary and commercial success." This has been the position THE SANITARY ENGINEER has always held, notwithstanding the rose-colored statements of promoters of special methods of treatment, and of that class of writers who assume that Providence has intended that all waste matter should be returned to the earth, and that it is a wicked waste to discharge it into the sea, even if removed where it could be of no offence.

The adoption of a proper method of sewage disposal, as is the case with all other engineering undertakings, must be controlled by local circumstances. If sewage cannot be discharged into the sea or into a rapidly flowing river, in which the risk of a nuisance to dwellers on its banks will be practically nil, then the question of disposal by broad irrigation would naturally come under consideration. This would have to be controlled by the ability to acquire suitable land at a reasonable cost for the purposes of a sewage-farm. If this cannot be done, then the various processes of precipitation must be considered, and the amount of water in the sewage is an important element in the problem.

The most favorable accounts as to the profitability of conducting a sewage-farm that we have seen have been those published regarding the one at Pullman, Ill., in which this farm, which has been assumed to have been conducted as a model sewage-farm, has been shown to make a profit. A recent visit, however, to Pullman explained the reason of this alleged commercial success, which is due to the fact that the farmer manages the farm to raise crops and make money, only utilizing as much sewage as he needed to promote the raising of crops. In dry weather, and whenever no injury is done to standing crops, it is allowed to flow upon the fields. At other times it is either turned, during a part of the year, on a number of filter-beds, or, as these too are cultivated in turn, it is allowed to run in a crude state into the lake through an open ditch.

We cite this instance not to find fault with the management of the farm at Pullman, since it is conducted by the Pullman authorities in such a way as to satisfy themselves, they owning all the property in the neighborhood and there not being any neighbors to complain. The point we desire to make is, that as a farm for the utilization of the sewage of a town, it cannot fairly be called a model sewage-farm as it is conducted to-day. This, however, is no argument against the putting of sewage on land wherever practicable, and the raising of crops by its aid, and the purpose of this article is simply to call attention to the fact that no community should be misled by statements that would lead them to expect that they can conduct a sewage-farm that will utilize their sewage in an inoffensive way and at

the same time secure a return from the crops sold that will pay a profit on the cost of disposal. The most they can hope for to-day is to get back a portion of the expense of disposal from the sale of crops.

THE MASSACHUSETTS STATE BOARD OF HEALTH.

THE Bay State has again a State Board of Health which its sanitarians and physicians recognize and approve, and they are well pleased with the change.

The so-called State Board of Health, Lunacy, and Charity, organized in 1879, has never given satisfaction, and has been under a cloud from the first, owing to the strong and very natural suspicions which prevailed as to the motives for its creation. The board now created is substantially on the same basis and has the same duties as the first board, created in 1869, except that its field of action is somewhat enlarged.

The members of the new board are appointed for different periods, as one member goes out of office each year, but all subsequent appointments are to be for seven years. The appointees are as follows: For seven years, Dr. Henry P. Wolcott, of Cambridge; for six years, Dr. Elijah U. Jones, of Taunton (homœopathist); for five years, Mr. J. H. Appleton, of Springfield (a manufacturer); for four years, Mr. T. K. Lathrop, of Beverly (lawyer); for three years, Dr. F. W. Draper, of Boston; for two years, Mr. H. F. Mills, C. E., of Lawrence; and for one year, Mr. James White, of Boston (a retired merchant). It will be seen that the principle observed in the appointments has been to represent as many different interests as possible, and for a board, which has certain legislative and quasi-judicial functions, the principle seems to be a good one. We wish the new board a long, prosperous, and useful life.

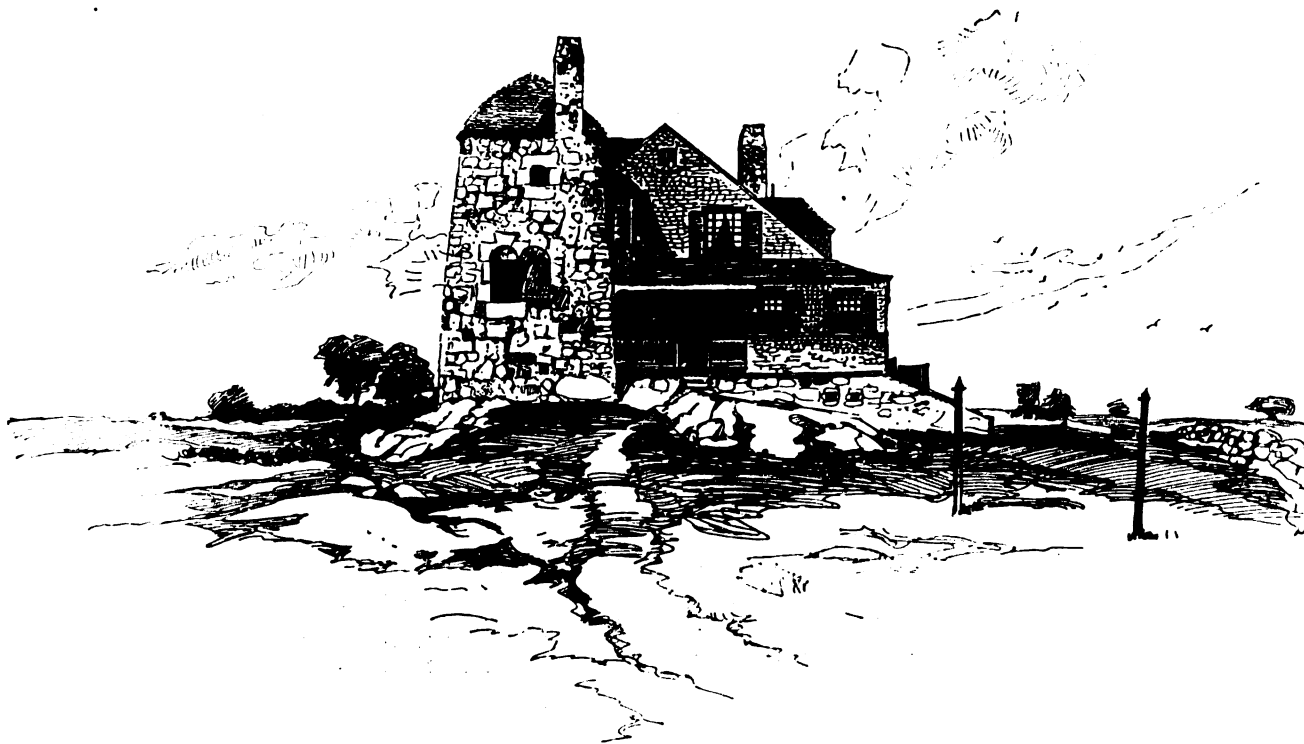
OUR readers will find in a *resume* of a controversy over the question of "joint control" in the matter of the engineering work in connection with the Vyrnwy scheme for the new water-supply of Liverpool, to which we devote elsewhere in this issue considerable space, some instructive reading. The publication of the second letter from Mr. Deacon suggested that, in the absence of the information we have this week given, most of our readers would fail to recognize from the letters of Messrs. Deacon and Hawksley anything beyond a personal dispute about a title. It will be seen, however, that the letters relate to a matter which touches upon principles that are too little recognized in the conduct of public engineering undertakings, especially in this country. Laymen, commissioners, and even engineers may therefore learn a valuable lesson from the experience here recorded.

REPORTS have been made to the Water Committee of the Liverpool Council on the subject of the Vyrnwy dam by Major-General Sir Andrew Clarke, Asst. Inst. C. E., and Mr. Russell Aitken, M. Inst. C. E. These gentlemen arrive at the conclusion that the dam is well built and abundantly strong. From what they report as having seen, they would seem to be justified in these statements; manifestly, however, those only who have *seen* the rock on which the dam rests and the methods pursued in construction can have an intimate knowledge of all the facts. Mr. Thomas Hawksley has taken a different view on several points, and his large experience justifies him in being very tenacious of his opinions. As the differences are respecting facts and not theory it is impossible for us to judge of them except upon details and drawings, which are not in our possession.

ble. Upon a production of a certificate, signed by the medical officer or his assistant, a magistrate's warrant can be obtained empowering the corporation officers to remove any specified person to the hospital. Liverpool is fortunate in the centralization of the sanitary authority for the whole city in one municipal office, which, of course, regulates the whole district, in satisfactory contrast to the numerous vestry authorities of London, where one set of regulations may be in effect in one street and something quite different in the next.

There is a feature in connection with the "Road" of the Liverpool Tramway Company in some of its sections which is, I think, peculiar to the company, and which must have effected a very considerable saving in its original construction. Taking for example that section between the city and Wavertree (a suburb), the line is here to all intents and purposes a single one, but has at intervals of about every hundred yards a loop-line. This loop runs for about another hundred yards, and then runs again into the single line. Although there is at present considerable traffic,

our sewage. He was satisfied that it is so arranged that the population of any given country can grow food enough for all its people by the utilization of its refuse, embracing in the term street and stable sweepings, trade and house refuse, sewage, etc. In the event of a hostile combination of European powers against England, he was assured we should be disastrously defeated, as a starving people would compel submission, all because we will not put the sewage on the land. He stated that the sewage and refuse of 100 people, properly utilized, would grow two bullocks and produce milk enough (from the bullocks or from the sewage?) for the 100 people. The theoretical tracing out of this statement of the doctor will give rather funny results. There are, of course, "expert" opinions for and against the "utility" system, but it is a great pity that any lecturer should present the *reductio ad absurdum* to any audience, and on such groundwork ask it to accept the principles. Following the address of Dr. Carpenter, a London weekly has been giving its readers two alarmist leaders, arguing that as the sewage of London contains the residuum of the food of 4,000,000 of people, it is a



A HOUSE ON THE COAST AT NEWCASTLE, N. H.—E. M. WHEELWRIGHT, ARCHITECT.

OUR BRITISH CORRESPONDENCE.

Private Donations to Establish Public Baths—Treatment of Infectious Disease Cases in Liverpool—The Liverpool Tramway—The Mersey Tunnel Railway—Dr. Alfred Carpenter on Sewage-Disposal—Annual Meeting of the Institute of Civil Engineers.

LONDON, May 29, 1886.

THREE gentlemen, whose names do not transpire, have offered to defray the cost of building and equipment of public baths, to include a large swimming-bath in St. George's-in-the-East. The only condition attached to the offer is, that the vestry shall take over the whole management of the baths, and use for that purpose the whole of the receipts, no portion of which is to be diverted to other objects in the parish. The vestry, of course, accepted this munificent offer. The boon of such a gift to a district so densely populated with the poorer classes, as is St. George's, is incalculable, while it cannot fail to improve the health of the neighborhood.

The procedure of the Liverpool public health officers in connection with cases of infectious diseases is commenda-

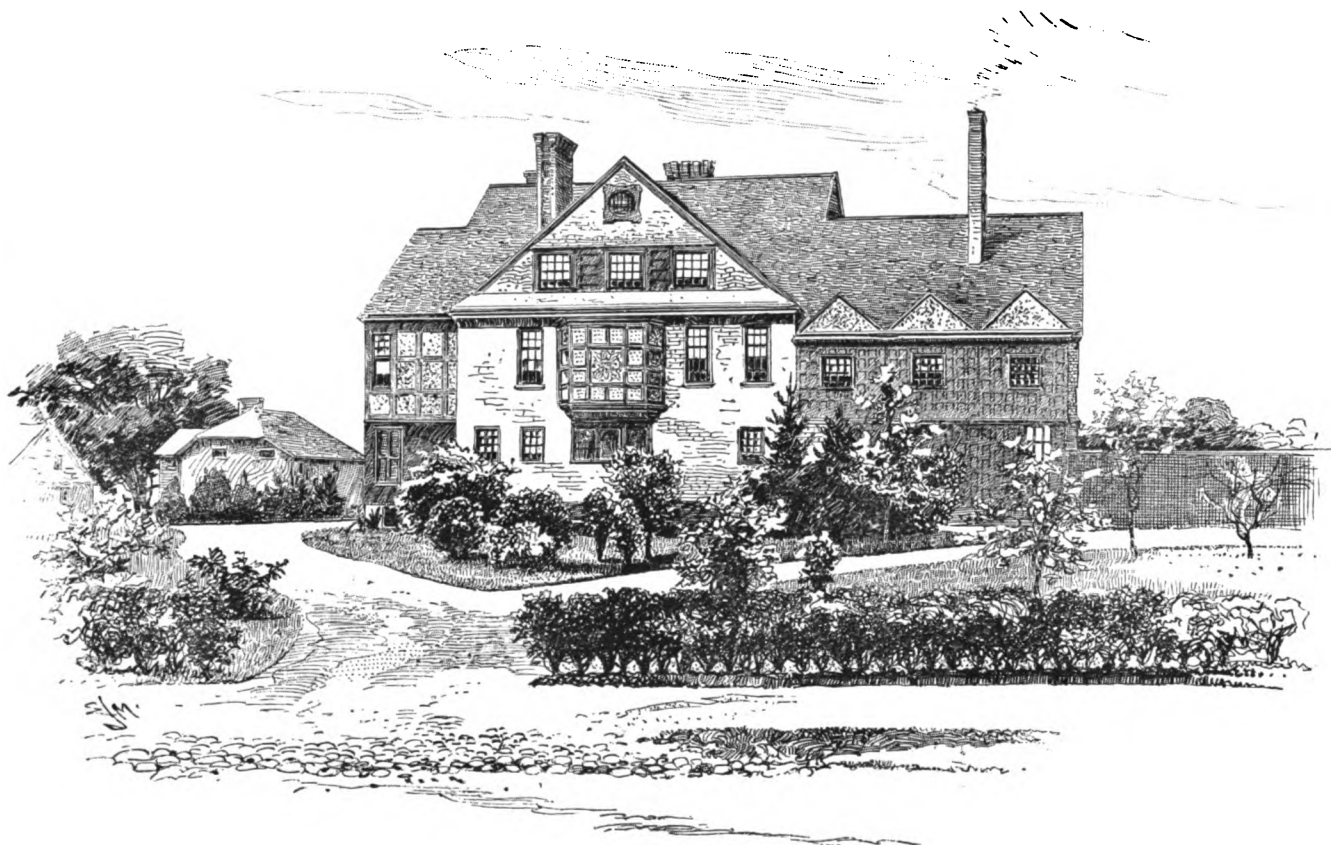
owing to the International Exhibition at Wavertree, cars running to and fro at intervals of some seven minutes, there is no delay in waiting on the loops, as is the case with the usual system of single-line services.

The engineers in charge of the Mersey Tunnel Works, in connection with the new railway which passes under the Mersey between Liverpool and Birkenhead, are experiencing very considerable trouble in connection with subsidence of the land. Unfortunately for the Railway Company, this land is built on, and the result, of course, is a very considerable additional expense. Several blocks of buildings were affected in this respect some months since, and further similar cases are now occurring in Beckwith Street, Birkenhead. The immediate cause of the subsidence would appear to be the withdrawal of immense quantities of water, which collects in the various shafts which have been sunk. This water has to be pumped out daily and passed into the main sewer, and takes with it a quantity of sand and gravel.

Dr. Alfred Carpenter, in a recent address before the Association of Sanitary Inspectors, predicted famine for us, in the not distant future, because we will not utilize

burlesque on common sense to throw it into sea, the process entailing an annual monetary loss of £155,125, reckoning the value as 10s. per ton. Later on it reckons the annual loss as £16,000,000 and compares it to a daily loss of 10,000,000 quartern loaves of bread thrown into the sea. This journal recommends the acquisition of two large depots where sewage in the form of compressed sludge, to the amount of 850 tons daily, may be stored. In other words, if the obstinate landowners and farmers, who have combined to resist the use of the fertilizing product to their own manifest disadvantage, will not use the stuff, save up this enormous quantity until such time as they see the error of their ways.

The recent annual meeting of the Institution of Civil Engineers at their commodious premises in Great George Street, Westminster, was one of the largest that has been held for years, upward of 400 members putting in an appearance. The annual report of the council was well received, a burst of applause following the announcement that the present Secretary, Mr. Forrest, had held office for thirty years. The Institution may well be congratulated upon retaining the services of such a secretary, as it is



THE SANITARY ENGINEER ILLUSTRATED SERIES.

A RESIDENCE AT NEWPORT, R. I.

CLARENCE S. LUCE, ARCHITECT.

1. The first part of the paper
 discusses the general principles
 of the theory of the
 function of the
 system.

2. The second part of the paper
 discusses the specific
 features of the
 system.

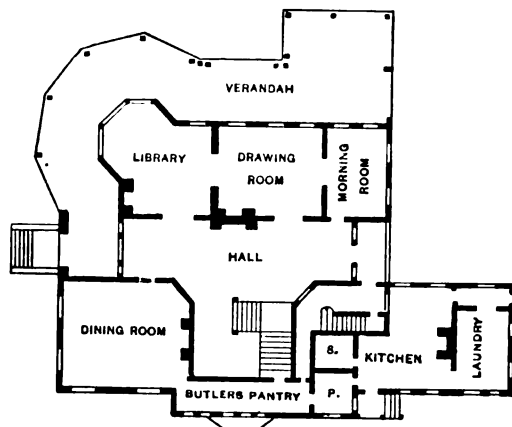
3. The third part of the paper
 discusses the results of the
 study.

mainly through him that it is in its present prosperous condition, numbering as it does upward of 4,000 members and associates, with an income of nearly £10,000 per annum.

OUR SPECIAL ILLUSTRATION.

A RESIDENCE AT NEWPORT, R. I.—C. S. LUCE, ARCHITECT.

We give this week two views of the residence of Dr. John T. Mason, at Newport, R. I. The house is covered with shingles, which are not stained, but left to weather.



The exterior trimmings, panel-work, and half-timber frame-work are of natural finished ash. The half-timber work and small gables are filled in with beach pebbles set in cement, so as to show a surface all pebbles. The cost of the house was about \$21,000.

The architect is Mr. Clarence S. Luce, of New York.

An electric elevated railroad is projected in St. Louis. The distance to be run is about four and one-half miles, and the bill incorporating the company, which is now before the Missouri House of Delegates, provides that the motive power shall be electricity only.

OUR ILLUSTRATION OF A MODERATE-COST HOUSE.

A HOUSE ON THE COAST AT NEWCASTLE, N. H.—E. M. WHEELWRIGHT, ARCHITECT.

This house is the residence of Mr. Edmund C. Stedman, the poet. It stands on an open stretch of moorland close by the sea, at Newcastle, N. H. The tower and some of the lower portions of the house are of field stone; the rest of the house is framed and covered with stained shingles. The interior finish is very plain, painted pine throughout. The house cost about \$6,500.

The architect is Mr. Edmund M. Wheelwright, of Boston.

THE NEW CROTON AQUEDUCT.

No. IX.

(Continued from Vol. XIII., page 369.)

SHAFTS 31-32, ETC., AND OVERFLOW AT SHAFT 26.

SHAFT No. 26 is 525 feet below shaft 25, and is to have a depth of 116 feet and a section in excavation of 16x16 feet clear of all obstruction from timber or rock. The finished shaft will have twelve feet three inches internal diameter, and the brick lining will be 16 inches thick.

Figure 12 gives a sectional plan, front elevation, and transverse and longitudinal sections of the shaft and overflow-chamber.

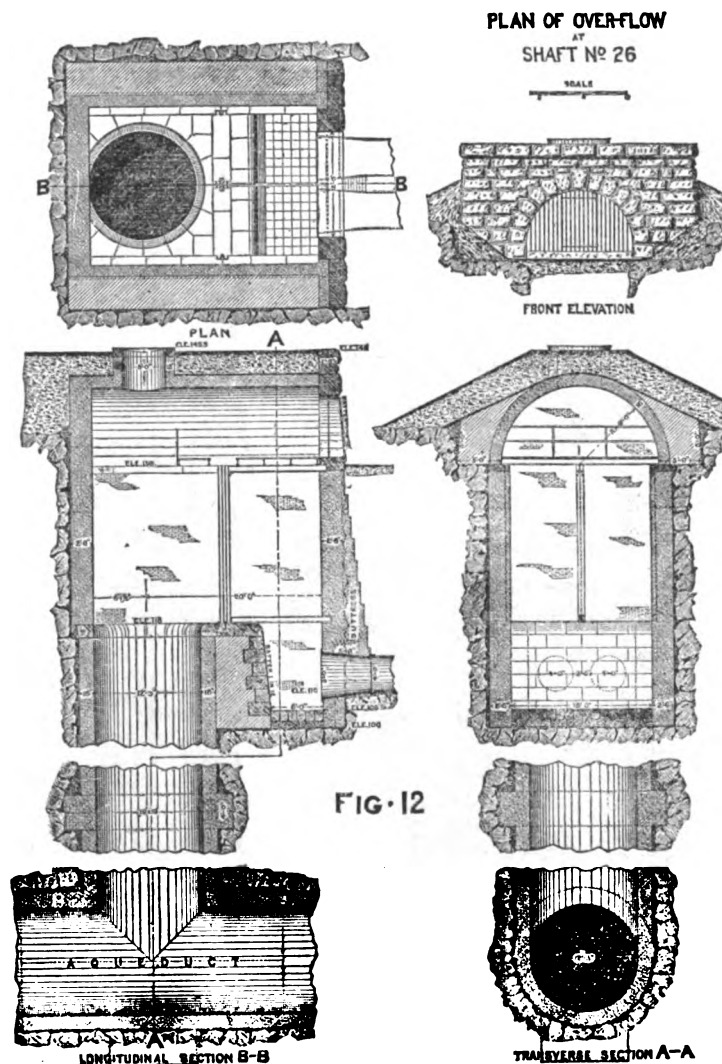
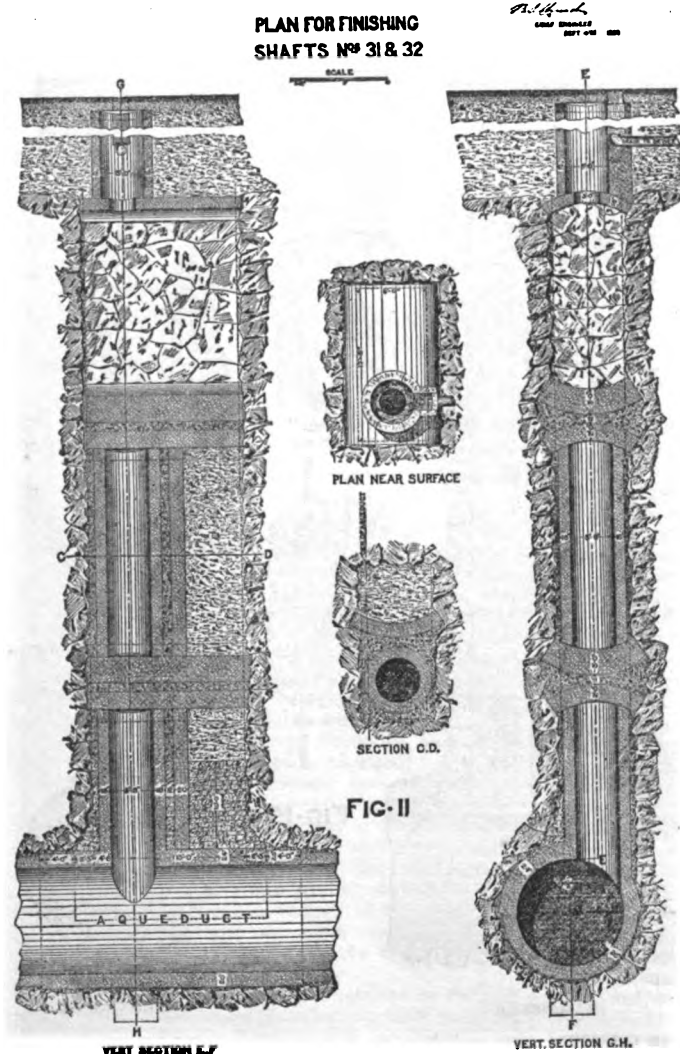
An overflow is provided at the elevation of 118 feet into a receiving-basin 10 feet deep and 16 feet wide, from whence the water will pass through conical entrances into two pipes, four feet each in diameter, leading to the river. The greatest hydraulic head at this point will be 131 feet above datum, it being reduced to this from 140 feet at the Croton dam by frictional resistances. Grooves are shown in plan and section B B for stop-planks, by means of which the whole of this head may be made available to increase the head on the pipes leading from the gate-house at One Hundred and Thirty-fifth Street. This will give a possible variation of 13 feet in the head. The entrance to the chamber will be through the door in the grating shown in the front elevation, and the platform within is to be supported on iron I-beams.

Figure 11 gives the details of the two lowermost shafts on the aqueduct. These will be excavated to 8x17½ feet

in section, clear of all obstructions, and are to be respectively 78 feet and 86 feet deep. The finished shaft will have a 16-inch brick lining of five feet interior diameter. The lining will be surrounded by concrete, and to save concrete about one-third of the section will be cut off, as shown in section C D, for a portion of the height by a 20-inch brick arch with vertical axis, the remaining space being filled with earth. This arch is considered necessary also to prevent any compression of the earth-filling and consequent danger of bursting, as the result of the internal water-pressure. The hydraulic level at these points would cause the water to overflow the surface of the ground, and, as the shafts will seldom, if ever, be used after construction, each will be cut at two points by solid arches, as shown, with a total thickness of six feet at each point at the centre. The uppermost of these will be about twenty feet below the surface of the rock and about 32 feet below the street surface. The 20 feet mentioned will be left unfilled, and a 16-inch arch turned over the space. Above the latter arch the shaft is continued in 12-inch brick-work, and will be closed over by a heavy cast-iron plate at about 20 inches below street grade, the street-paving being made continuous. This plan is adopted so as to make it possible to open the shaft again, should it be necessary, at a comparatively small expense. To provide for the contingency of a possible leakage upward a drain-pipe will join the upper section of shaft with the street-sewer, a side chamber or manhole being arranged for this purpose, to which access can be had through an opening in the street.

Figure 13 shows the construction of shafts 27, 28, and 29. These are to be the same in size as the last described, and have depths respectively of 143 feet, 123 feet, and 114 feet. As these are to remain open, they are provided with ladders, and have an entrance provided through the street surface. It will be noted that the arch to resist horizontal thrust is carried to two feet above the hydraulic level.

Figure 14 gives details of shaft No. 30, which has a depth of 80 feet. As the hydraulic level will be such as to cause water to overflow from it, and it is considered desirable to have ready access to the aqueduct through it, the construction will be quite different from that last described. The dimensions of the excavation, the double arches across, as also the arch with vertical axis, and earth-filling will be



essentially the same. The section next above the aqueduct will be finished with five feet four inches internal diameter. The section next above will be bottle-shaped and oval in section, having diameters of nine feet and six feet. There will be a similar shorter section next above this, which will terminate in a vertical section five feet in diameter, reaching to within 20 inches of the street surface and covered with a cast cover-plate for paving over. The section next over the aqueduct will be joined to the next above, and that with the third by openings about four feet six inches diameter, which will be lined with heavy castings, having strong cast-iron covers securely bolted to them. Valves operated by rods from above will allow of the discharge of water which may have found its way into either of the upper chambers, and a drain near the top will provide for the discharge of water into the sewer should any large quantity force its way upward.

(TO BE CONTINUED.)

LIVERPOOL WATER-WORKS.

THE VYRNWY MASONRY DAM.

LIVERPOOL, May 27, 1886.

SIR: In his letter to you of the 28th ult., printed in THE SANITARY ENGINEER of 13th inst., Mr. Hawksley refers to a letter from the Town Clerk of Liverpool, dated September 14, 1885, regarding my position as Engineer of the Vyrnwy Water-Works; but Mr. Hawksley has omitted to say that—having found prior to this date that the alleged differences between his agreement and my own (both of March, 1881,) were likely to create an unfortunate disruption—I had written to the City Council on May 19, 1885, and subsequently to the Town Clerk, intimating in effect that rather than "cause embarrassment or difficulty to the corporation," I was prepared to be bound by the terms of Mr. Hawksley's agreement, without respect to the difference (not admitted, I believe, by the corporation) in the effect of the two agreements. Whether or not any difference of effect existed, this act could not alter the facts as to my position up to that date. Mr. Hawksley did not withdraw his resignation; the concession never came into operation, and the facts remain precisely as stated in your publication of April the 8th ult.

Having projected and worked out and prepared the plans for the scheme of water-supply to Liverpool, I acted as "joint engineer" with Mr. Hawksley for carrying it

through Parliament, and subsequently as "engineer in conjunction with" him for carrying on the works.

It would be fruitless to discuss whether there is or is not any difference in effect between a "joint engineer" and an "engineer in conjunction with," nor do I care to refer to the statement in Mr. Hawksley's letter to you, of dissatisfaction as to the way in which I carried on the work, and am still carrying it on, except to say that, although I was well aware of his general expressions of dissatisfaction, Mr. Hawksley never concurred in the courses necessary to remove his objections, except where those courses were adopted.

It is scarcely necessary to add that, in my own judgment, there have been no grounds for dissatisfaction, except such as have arisen from the cost of adapting certain natural conditions to the ends in view; but this question has been referred to others to report upon.

It is much to be regretted that Mr. Hawksley's letter should oblige me to ask you to publish matter in which your readers can scarcely be interested.

Respectfully, GEORGE F. DEACON.

[The apparent conflict in the statements in the various letters of Mr. Deacon and Mr. Hawksley brought out by our reference to Mr. Deacon as assistant engineer in connection with Vyrnwy Dam work may not be of any special interest to a number of our American readers, yet we have decided to print the above letter of Mr. Deacon, and at the same time give a *resume* of the history of the facts which led to this controversy, which we trust will conclude, so far as our columns are concerned, the personal aspect of the case, which to our readers is only a feature, and one that would hardly justify the publication of the above letter. The lessons, however, to be learned from this unfortunate controversy by commissioners are so important, and the principles that should govern the engineering control of all engineering undertakings are so plainly made manifest, that it seems proper to give a summary of the evidence as we have it, quoting such parts as seem desirable for a clear understanding of the points involved.

It will be remembered that Mr. Deacon's letter, published in our issue of April 8, was brought out because of a reference to him as "assistant engineer" in a description of some work on the Vyrnwy Dam. Mr. Deacon, in that communication, objected to the word "assistant" and claimed that he was "engineer in conjunction with" for the carry-

ing out of the work. Mr. Hawksley, in his letter of April 28 denied that Mr. Deacon was ever "engineer in conjunction with" him for carrying on the work. The justification for the claims of Mr. Hawksley and Mr. Deacon will appear later on in this *resume*. From the evidence, it seems that, prior to 1880, Mr. Deacon, then Water Engineer of Liverpool, was employed for a long time preparing preliminary plans, reports, and estimates of several projects for the water-supply of Liverpool, comparing the relative values of each. After considering the relative advantages of the Haweswater and Vyrnwy schemes, and obtaining reports from Mr. Hawksley and Mr. Bateman on the information furnished by Mr. Deacon, the council adopted the Vyrnwy scheme and decided to apply to Parliament for a bill to carry out the work, as is necessary in all great public undertakings in Great Britain. The Liverpool council found it necessary to procure the services of Mr. Hawksley in order to facilitate the procuring of the Act of Parliament, as explained in the following extract from the remarks of Mr. Bower, the Chairman of the Water Committee at the time the agreement with Mr. Hawksley was under consideration by the council:

"Mr. Bower, in seconding the motion to adopt the agreements, stated that 'at one time there was an idea that Mr. Deacon should act as engineer to the scheme, but much as he respected him and highly as he appreciated his talent and general ability, he for one never entertained such an opinion.' He felt this, that with all Mr. Deacon's ability and talent, he had not the practical experience in carrying out works of such magnitude as would justify their employing him on his sole responsibility. He believed the result had verified the impression which they then entertained, because he was sure if they had not had the experience and ability of Mr. Hawksley they should have failed to carry the bill through Parliament."

Mr. Bower, at the request of the Water Committee, arranged with Mr. Hawksley for his signing of the plans and acting as "joint engineer" with Mr. Deacon to assist in carrying the bill through Parliament. The Chairman of the Water Committee subsequently maintained that Mr. Hawksley was to act as joint engineer if the work was carried out. On this point he is flatly contradicted by Mr. Hawksley, who states that the "joint engineership" was not to continue after Parliament had sanctioned the scheme.

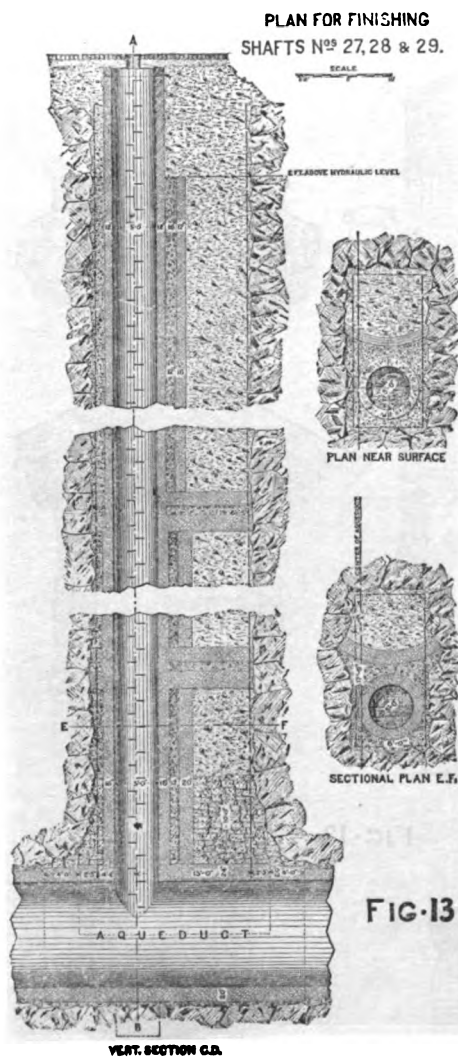
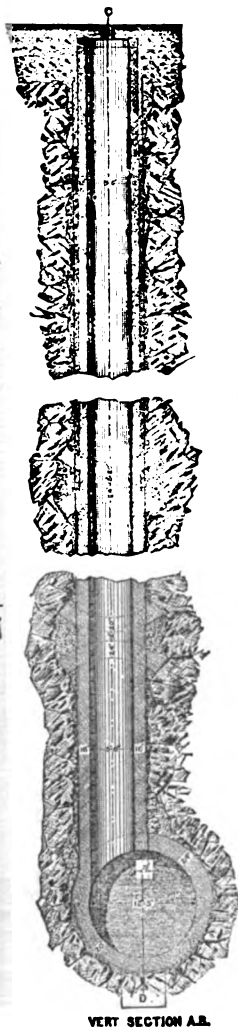


FIG-13



VERT. SECTION A.B.

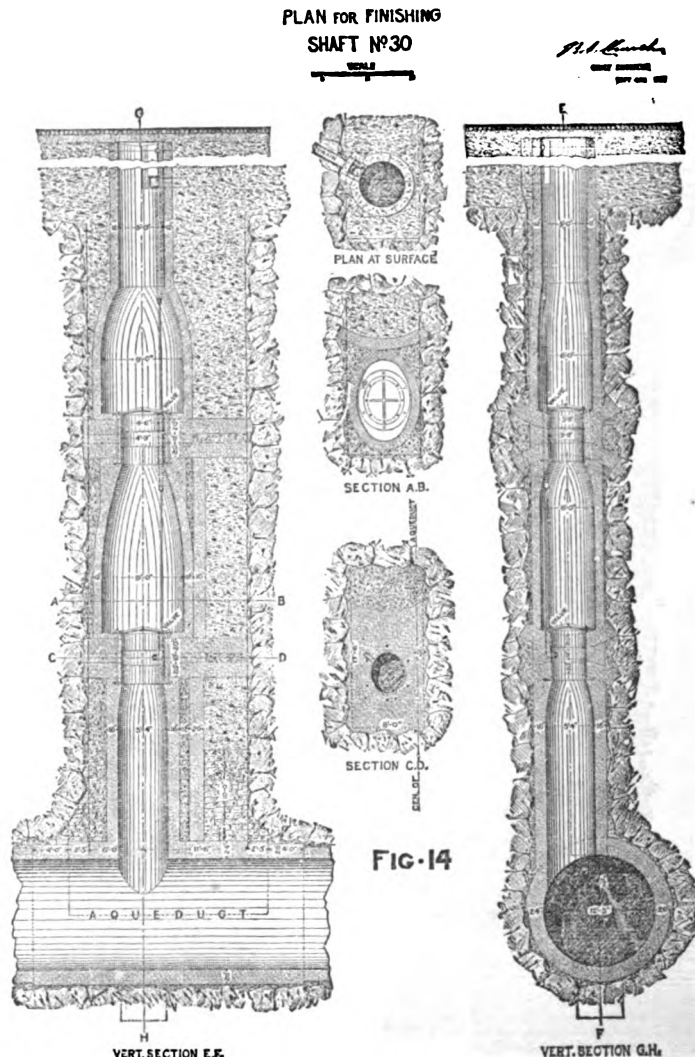


FIG-14

VERT. SECTION G.H.

THE NEW CROTON AQUEDUCT.

Mr. Hawksley explains his understanding of the verbal arrangement with Mr. Bower in a letter to the City Council, dated October 20, 1885, as follows:

- (1) Mr. Bower proposed and pressed his proposition that I and Mr. Deacon should act as joint engineers for the Vyrnwy Works for all purposes.
- (2) I declined, and assigned as reasons—
 - (a) That Mr. Deacon had no experience;
 - (b) That he was then and was to remain a salaried servant of the corporation, and was not, therefore, a free professional man;
 - (c) That Mr. Deacon's financial position would not enable him to take his share of the risks and responsibilities of so great an undertaking.
- (3) Mr. Bower assented to the force of these reasons.
- (4) Mr. Bower next proposed that Mr. Deacon should be recognized as joint engineer for the purpose of application to Parliament for an act.
- (5) After some conversation I assented to this request, on the then stated ground that it would not involve me in any responsibility, and would terminate with the passing or rejection of the bill.
- (6) Mr. Bower next entered on the discussion of the pecuniary terms.
- (7) I informed him that the charges of responsible hydraulic engineers were usually five per cent. on the cost of constructional work.
- (8) Mr. Bower asked whether, if the corporation provided an efficient resident engineer and staff, and relieved me of the cost and trouble of the detail supervision, I would accept the same rate of remuneration as I had received at Leeds and Huddersfield, where I had professional gentlemen of means, experience, and responsibility associated with me. This was the three per cent.—my share of five per cent.
- (9) I assented.
- (10) But again, said Mr. Bower, if we put Mr. Deacon in as we wish to, we shall have to pay him a much higher salary than to an ordinary resident engineer.
- (11) At last I said, after demurring considerably, then put my remuneration at 2½ per cent., and give Mr. Deacon what you please.
- (12) Soon after this Mr. Bower again returned to the charge, saying, "But, then, you know, there will be the Parliamentary costs. I think, considering all the circumstances of the case, and that we have had a considerable staff of surveyors for some time on the work, and that you will personally have very little trouble (the opposite afterwards proved to be the case), you ought to allow your fees, if the bill is obtained, to merge into the 2½ per cent.; but if not obtained, you shall be paid your regular charges."
- (13) I did not by any means see the cogency of this reasoning, but I admitted that, being overcome by the bland manner and seductive expressions of Mr. Bower, I again yielded.

The bill having passed, and received the Royal assent, the chairman, in his report, states that it then became necessary to enter into an agreement with Mr. Hawksley in accordance with the verbal arrangement he had made with him in Paris. The late Town Clerk also advised that it was prudent to enter into a contract with Mr. Hawksley, and two copies of the agreement were prepared by the Town Clerk, and one was submitted to Mr. Hawksley for his approval. Mr. Hawksley promptly objected to the words "joint engineer," besides other items in the form of agreement submitted to him.

This was in December, 1880. Then follows correspondence between Mr. Hawksley's solicitors, the Town Clerk, and Mr. Bower, all indicating that Mr. Bower, Chairman of the Water Committee, was trying to overcome, by means of letters and interviews, Mr. Hawksley's opposition to the "joint engineership," and by some means or other secure that position for Mr. Deacon, and it was not until March, 1881, that an agreement was made satisfactory to Mr. Hawksley, in which his position was defined as follows:

"And whereas it has been agreed that the said *Thomas Hawksley* shall act as *Engineer-in-Chief of the Corporation*, in the carrying out of the works hereinafter mentioned, authorized by the act."

"1. Now it is hereby agreed by and between the corporation and the said *Thomas Hawksley* that the said *Thomas Hawksley* shall (with the assistance as hereinafter mentioned of the said *George Frederick Deacon*, or such other engineer as shall for the time being be appointed by the corporation to perform the duties hereinafter provided to be performed by the said *George Frederick Deacon* or other the engineer to be appointed in his stead) act as the *Engineer-in-Chief of such reservoirs and other similar works as the corporation have determined or may hereafter determine to construct under the powers of the act*, and of the tunnels and first line of pipes from the Vyrnwy Reservoir to the Prescott Reservoir, and of the whole or so much of the filter-beds and other works connected therewith, and of so much of the second and third lines of pipes as may be constructed and laid simultaneously with the laying of the first line of pipes on the terms and conditions herein stated."

"2. All orders, instructions, or directions of the corporation relating to the said works shall be duly recorded in the proceedings of the Council, or of the Water Committee of the Council, and copies thereof, under the hand

of their Town Clerk, shall be notified to the said *Thomas Hawksley*, by being given to him or left at or sent by post to his place of business, and he shall be deemed thereupon to have had due notice thereof."

"3. The corporation may, from time to time, direct which of the said works shall be constructed, and in what order, and may rescind or alter their resolutions thereon as they may from time to time think fit. And the corporation shall provide all necessary inspectors, clerks of works, timekeepers, testing officers, and other servants, to see to the due execution of any contracts for works or materials, and of any works undertaken by the corporation, and to the carrying out of the said works under the direction of the said *Thomas Hawksley*."

"4. The said *Thomas Hawksley* shall, as soon as practicable after the date of the resolution directing any particular work to be constructed, and upon the requisite surveys and levels of the lands required for the same being furnished to him by the corporation, make and provide in duplicate such plans, designs, sections, detailed drawings, and specifications, and shall give such advice as to costs of works and otherwise as may be necessary and suitable for advantageously letting and carrying out the construction of such works by contract, or for enabling the corporation to undertake and carry out their construction; and one set of all such duplicate drawings, plans, designs, sections, and specifications, or any of them, or any part or parts of them (if the same shall be incomplete), shall be deemed to be the property of the corporation, and shall be delivered to the corporation, and the other set shall, subject to the provisions of these presents, be deemed to be and remain the property of the said *Thomas Hawksley*. The said drawings, plans, designs, sections, and specifications are to include all details which are necessary, and are usually supplied by the engineer to corporations, to enable them to enter into contracts, or to execute works themselves, or by contractors for works and materials under them."

"5. The said *George Frederick Deacon*, or other the engineer for the time being of the corporation to be appointed in his stead as hereinafter provided, shall take the general and constant supervision of the said works in consultation with the said *Thomas Hawksley*, and shall duly discharge all the duties usually performed by a resident engineer."

"In case the said *George Frederick Deacon*, or any engineer to be appointed in his stead as hereinafter mentioned, shall cease to be the engineer of the corporation for the performance of the duties to be performed by them respectively, as aforesaid, the corporation shall, as soon as practicable, appoint another engineer in his stead."

"The corporation shall, before making any such appointment, give fourteen days' notice thereof to the said *Thomas Hawksley*, and if he shall object to the fitness of the engineer proposed to be appointed, the question shall be referred, on the application of either party, to the president for the time being of the Institution of Civil Engineers as sole arbitrator (subject, so far as the same are applicable, to the provisions as to arbitration, hereinafter contained), whose decision shall be final and conclusive."

"6. The said *Thomas Hawksley* will do and perform, in relation to the said works, all things usual and proper to be done in relation to similar works by an *engineer-in-chief entrusted with the designing, superintendence and direction of such works*, and will exercise the due diligence and skill in all matters connected with the execution of the said works which are incidental to his position as *engineer-in-chief* and the practice of his profession in the designing, superintendence, and direction of the execution of such works as the corporation shall from time to time order to be constructed according to the plans, designs, and specifications thereof, subject to such alterations as the said *Thomas Hawksley* may from time to time deem necessary, and where important, as shall be approved by the corporation, and he shall use his best endeavors to get the several works executed and completed in a proper manner, and with due regard to economy and expedition."

"7. The said *Thomas Hawksley* shall, with such assistance of the said *George Frederick Deacon*, or other the engineer for the time being to be appointed in his stead as aforesaid, as he, the said *Thomas Hawksley*, is entitled to under these presents, report in writing to the corporation the progress and condition of the works from time to time if and when reasonably required by them so to do."

"8. All principal plans shall be subject to the approval of the corporation, and all specifications shall be subject to the like approval before such specifications are issued, but the approval by the corporation of such specifications, when not otherwise given, shall be considered to have been given by the acceptance by the corporation of any tender based upon them respectively."

"9. The said *Thomas Hawksley* shall advise the corporation and act as their *engineer-in-chief*, with such assistance of the said *George Frederick Deacon*, or other the engineer for the time being to be appointed in his stead as aforesaid, as he, the said *Thomas Hawksley*, is entitled to under these presents in the matters aforesaid, and shall, without any extra charge beyond the commission or percentage allowance hereinafter mentioned, attend to all matters within his department as *engineer-in-chief* of the said works during their progress to completion, and if any of the said works shall be let to contractors until the period during which such several contractors shall have agreed to maintain and uphold the same shall be fully completed, or until the expiration of one year after the works, if constructed by the corporation, have been brought into use, and the said *Thomas Hawksley* shall, when necessary, give his attendance pending any dispute with

any contractor or contractors employed as aforesaid, or in any action, suit, arbitration, or other legal proceedings with reference thereto, and attend whenever it may be necessary and when requested so to do the meetings of the Water Committee or Council of the Corporation for the purpose of personally informing them of and advising them on the matters which may arise from time to time during the progress of the works under this agreement."

Fourteen days later, March 16, an agreement was made with Mr. Deacon by the council, as it appears, through the efforts of the chairman, Mr. Bower, in which it was stipulated:

"And whereas it has been agreed that the said *George Frederick Deacon* shall continue in the service of the corporation until the completion of such reservoirs and other similar works as the corporation have determined or may hereafter determine to construct under the powers of the said act, and of the tunnels and first line of pipes from the Vyrnwy Reservoir to the Prescott Reservoir, and of the whole or so much of the filter-beds and other works connected therewith, and of so much of the second and third lines of pipes as may be constructed and laid simultaneously with the laying of the first line of pipes, upon the terms and conditions hereinafter contained—that is to say—"

"1. The said *George Frederick Deacon*, as *engineer in conjunction with* the said *Thomas Hawksley*, or in case the corporation shall appoint or employ another engineer in his stead, then in conjunction with such other engineer, shall continue in the service of the corporation until the first day of January or the first day of July, whichever shall first happen next after the delivery of water into the Prescott Reservoir, or in Liverpool, through and by means of the works hereinbefore mentioned, and shall during the whole of such period devote his whole time and attention to the duties of his office, and shall not directly or indirectly engage in any other business or employment whatever, or accept or undertake any office, duty, or service, except on behalf of a corporation or other local authority with the express recorded permission of the Water Committee on each occasion, and on the payment of expenses to the corporation as provided by the terms and conditions hereinafter mentioned, subject to any modifications which may be made by the corporation, in the said terms and conditions."

This agreement made with Mr. Deacon, though affecting Mr. Hawksley, Mr. Hawksley was not a party to, and for several years it appears he was ignorant of its details, though it is stated it was read in the Council meeting and made public in the Liverpool papers, and was referred to by Mr. Deacon in a letter to Mr. Hawksley, which letter, however, Mr. Hawksley never received for several years, as will appear further on. This letter, which explains how Mr. Deacon very naturally thought Mr. Hawksley was acquainted with the terms to which he objected so strenuously, was written September 15, 1881, and is as follows:

"Until the Liverpool Water Act of 1880 was passed, I had believed, and the belief was largely based upon the specific assurance of the then chairman, that the general understanding was, that if the powers were obtained I was to be appointed engineer for the carrying out of the works. Even as late as our visit to the Severn this was very distinctly stated. It never occurred to me that you sought the appointment, and this view was supported by what I thought a pointed reference of yours to the action of another eminent engineer under similar circumstances. Mr. Bower had asked me very shortly before the completion of the Parliamentary plans, in the considerate manner for which I always thank him, whether I did not think it desirable that you should sign those plans jointly with me. I thought it rather late in the day; but, on consideration of your position as a Parliamentary Engineer, I agreed that it was desirable to ask you to do so. Upon this being done, my position in the matter was obviously very materially changed in your sight, but hearty and mutual action being necessary for success, I endeavored to assist in producing it."

"Until the act was passed, and until after Mr. Bower's subsequent visit to you in London, not a whisper ever reached me of the proposal made in Paris that you and I should act even as *joint engineers* for the carrying out of the works. It came to me as a surprise and a disappointment. I believed then, however, that I saw the full extent of my position in relation to you, and when I saw also that the Water Committee desired the joint engineership to be established, I at once threw aside all previous expectations and endeavored to work up to the new position. At this point let me tell you how fully I appreciate, and how cordially I thank you for your repeated endeavors to make my pecuniary position under the corporation a better one; but I never could understand, and do not now understand, why the fact of my not being paid by commission should have made you wish to change the terms of the Paris agreement, and to make my position in the scheme still less important than you and Mr. Bower had arranged."

"Almost immediately before the execution of your agreement, you conceived a difficulty concerning the words 'joint engineers,' though I believe that all those representing the corporation intended that they should be retained. At the suggestion of Mr. Bower, I saw you on the subject in London; you shortly explained, though I failed to understand, the legal difficulty, and you declined

to reinsert the word 'joint,' but you said in effect, 'It will make no difference to you.' My reply, to the effect that it could not fail to make a difference if the alteration were known, was met by the reply, 'Oh, this will be stowed away and probably never seen again!' or by words of similar meaning. My desire for peace, possibly also my faith in human nature, and certainly my full belief that although the word 'joint' had not been inserted, we continued to be engineers for the scheme with equal responsibilities, induced me to avoid further collision with you in the matter. You may therefore imagine my utter astonishment, when one day shortly afterward in committee, in reference to a remark by some member concerning our joint engineership, the Town Clerk said: 'Mr. Hawksley has put himself down as Engineer-in-Chief.'

"Further comment is needless. I could not well, under the circumstances, have imported my own solicitor into the matter, but I had believed that, as I was still a paid official of the corporation, the Town Clerk would have seen that the agreed terms were carried out. In this I was wrong.

"My own agreement with the corporation, however, appointing me engineer in conjunction with you, makes my position much better than your agreement taken alone leaves it.

"The next point in your letter is that relating to the insertion of my name with yours on the plans and specifications. Your suggestion that this is done as a friendly thing I really cannot entertain. I believe my agreement makes it necessary. I never spoke to Mr. Bower on the subject until after he had seen you, when he assured me that the omission of the word 'joint' would make no difference in any other respect.

"Pray remember, also, that I worked out this scheme from its inception, that my whole thought and attention are concentrated upon it, and that my position in connection with it is of the utmost importance to me, while it must be of comparatively little importance to you.

Under these circumstances you cannot be surprised that I should tenaciously adhere to the position which I believe my agreement gives me."

It appears in evidence that this letter was not mailed, but was intrusted to Mr. Charles Hawksley. It was not handed, however, to Mr. Thomas Hawksley, and four years after, when a copy was received by Mr. Thomas Hawksley, a search in the office revealed the fact that the original had lain unnoticed and unopened in a drawer in Mr. Hawksley's office. This circumstance explains how during these years Mr. Hawksley was in a constant state of irritation at what he assumed to be the unwarrantable interference of Mr. Deacon with his (Mr. H.'s) prerogatives and responsibilities. It also explains Mr. Deacon's not unnatural assumption of what he considered his "joint" responsibility.

After the signing of the contract the plans for the embankment were considered, and a stone embankment instead of an earth one as contemplated in the plans submitted to Parliament was decided upon. It appears from the correspondence that it was during the consideration of the details of the plans for this stone embankment that the first friction was caused. The following brief extracts from a voluminous correspondence will indicate the effect an attempted dual control produced. On August 16, 1881, Mr. Hawksley wrote:

"I think we ought now to be opening the quarries. We must accumulate a large quantity of stone, and, during the next summer, place it in position with great dispatch. I want to cover the rock upon which the great wall is to be founded as speedily as possible, because there is danger of the water acting under pressure washing the clay out of the beds and joints beneath the artificial work and then exerting a powerful uplift in addition to the horizontal pressure."

Again, on November 30, 1882, Mr. Hawksley wrote to Mr. Bower:

"I suppose that nobody doubts that large stones *per se* are better than small ones so far as they are handleable and soundly bedable. I have not interposed otherwise than to point out that the wall must not stand on points or small areas or rapid inclines, as these will exaggerate the pressure and tend to split the superstructure, and that all loose and cracked and disturbed rock must be removed in order to prevent uplift insinuated under reservoir pressure."

Mr. Bower then states that as the work progressed there was the usual discussion of the details of the work, which at the time led to letters and remarks from Mr. Hawksley of a complaining character with reference to Mr. Deacon, but that these were not of a serious nature and had reference "to Mr. Deacon's manner rather than to his acting detrimentally and to the success of the work." The following extracts, however, from letters of Mr. Hawksley indicate that he was more disturbed than Mr. Bower's statement would lead one to suppose. On November 3, 1881, he wrote to Mr. Bower:

"Mr. Deacon makes this huge mistake. He is not content to conduct the orchestra, but desires to perform a tune upon every instrument in the band, from the triangle upwards, and to write the music too."

On February 18, 1882, Mr. Hawksley wrote to Mr. Bower:

"Either I am engineer-in-chief of this concern or I am not. If the latter, I know what to do. I enclose another letter which will indicate to you how I am interfered with and countervailed in all my efforts to do things for the best."

On February 27, 1882, Mr. Bower writes to Mr. Hawksley:

"I have had a long conversation with Mr. Deacon, telling him the impossibility of getting on well with our work unless there is a thorough understanding between you and him, and, also, that we cannot have the same work done twice over—viz., all exploring work as well as any other should only be undertaken on an understanding with you and to your approval."

March 1, 1883, Mr. Hawksley writes to Mr. Bower:

"Deacon wears and worries me so much that all my labors are more than doubled. I really cannot carry, like Sinbad, a kind of Old Man of the Sea upon my distressed shoulders. He is not of the slightest use to me."

The following indicates some of the causes of Mr. Hawksley's dissatisfaction which induced him to express a desire to retire.

On August 5, 1884, Mr. Hawksley writes to Mr. Deacon—masonry:

"The stones are in their shape or shapelessness horrible. I cannot conceive how they are to be made to bear the pressure. They have neither top, bottom, nor side. I cannot call them *quarried* stones. They are really nothing more than the fragments of exploded masses; my ideas do not coincide with yours on the subject of compression. I believe that the concrete will yield more than the slate, and that consequently the irregular and in many cases insignificant surfaces of slate will have to do all the work of sustaining the weight and pressure."

On August 8, 1884, Mr. Hawksley again wrote to Mr. Deacon:

"I am afraid lest the wall should 'spelch,' or split. It is immaterial whether the shapelessness of the blocks is due to an explosive force or to a wedging force, or partly to one and partly to the other. The fact remains that the stones have no proper beds."

On November 28, 1884, Mr. Hawksley wrote to Mr. Bower:

"I feel in a very painful position with respect to the quality of the masonry of the great wall and apprehend serious results. I do not believe that any care in building will make safe and satisfactory work with stone so badly quarried."

Mr. Bower, in justification of the two conflicting agreements made with Mr. Hawksley and Mr. Deacon, offers the following by way of explanation:

"The desire of the Water Committee and of the council in entering into an agreement with Mr. Deacon was rightly that he should have an intelligent knowledge of the work as it was put in hand, and whether he was acting in *consultation* with Mr. Hawksley, as stated in Mr. Hawksley's agreement, or whether in *conjunction* with him, as in Mr. Deacon's agreement, that he should have time to consider what he was signing when specifications or drawings had to be signed, and what work he was superintending the carrying out of, in the practical execution of Mr. Hawksley's plans; and there can be no doubt that with mutual consideration on the part of each engineer, such a *role* could be carried out without trouble or friction of any kind."

That such "mutual consideration," however, was not sufficiently shown must be evident from the letters in evidence. From these letters we extract the following:

On September 10, 1881, Mr. Deacon returned a proof of a specification stating that he had not had time to carefully consider it, saying:

"Having regard to the responsibility which my agreement imposes upon me, I must ask you to be kind enough to give me much more time in future to examine the printed proofs. Indeed it would be much more satisfactory if, knowing the general scope of your proposals, we considered some of the details together before the type was set up."

On December 3, 1883, Mr. Hawksley wrote to Mr. Deacon:

"You have certainly overlooked the fact that I am the Engineer in Chief, and that consequently I ought to have been consulted with respect to any and all works of a permanent character proposed to be undertaken. Two kings cannot sit upon one throne."

Mr. Deacon replied to Mr. Hawksley on December 5, 1883:

"You have drawn my attention by the use of a term employed in your agreement, to the unfortunate difference between it and our mutual understanding come to immediately before its execution, as to what my position, notwithstanding it, was to be. I am doing, and shall continue to do, my utmost to avoid contention on this point. As I have often previously said, I am most anxious to confer

with you on all points, and to make everything in the progress of the works known to you. I have long felt that you suspect this not to be so, but in this you have certainly been mistaken.

"I desire not to raise further unnecessary difficulties, and in the views I now express I entirely rely upon our mutual understanding. I am ready almost at any time to meet you in London, either with respect to the works, or the plans and specifications in progress."

Mr. Hawksley, in justification of the position he assumed, calls attention to the clauses of his agreement, and in defense of a specification of September 12, 1881, wrote to Mr. Deacon:

"My specification contained the result of fifty years' dealings with both parties to a contract. Every decision of the courts is watched for and the specification adapted to it. Every claim and difficulty of a contractor is considered, and, if necessary, a new provision is introduced or an old provision is modified or omitted. In this way I have become the parent of specifications, and my specifications are pirated in every direction. I put into them everything that is really essential, and I keep out of them everything that is faddy or which places undue restriction on what ought to be the discretionary part of a contractor's business."

"I shall be glad to insert in the specification everything that is reasonable, but I do object to overload a specification with minute restrictions and directions to the destruction of the elasticity of action necessary to a contractor's operations. It requires as much judgment to know what to omit as to know what to insert."

We have quoted from this correspondence in order to give ample evidence of the trouble that resulted from the anomalous positions in which both Mr. Hawksley and Mr. Deacon were placed by the conflicting agreements made with these gentlemen apparently at the instance of Mr. Bower. After these years of friction matters culminated when, during a debate in the City Council about the cost of the dam, some reflection was made upon the engineer. This coming to the notice of Mr. Hawksley, he promptly tendered his resignation. The committee requested Mr. Bower, the chairman, to meet Mr. Hawksley and endeavor to induce him to withdraw his resignation. On the 1st of April, 1885, the Town Council passed a resolution to the effect that no reflections were intended to be made upon him, and instructed the Water Committee to ask him to withdraw his letter declining to act as engineer-in-chief. Mr. Bower was again requested to endeavor by personal interview to bring this about. He reports that Mr. Hawksley, however, declined to act until he could see a copy of the agreement made with Mr. Deacon which had been referred to in the debates to which Mr. Hawksley took exception. On the 2d of May, after having seen a copy of Mr. Deacon's agreement, he wrote to the Town Clerk, stating that he would—

"Be glad to withdraw his resignation after the obliging and gratifying resolution of the 1st of April but for the subsequent disclosures of the so-called dual control, and that under these circumstances he left his resignation still before the council."

It then appears that a large number of letters passed between Mr. Hawksley and the Town Clerk, in which Mr. Hawksley insists upon the acceptance of his resignation, and the Town Clerk, on behalf of the Water Committee, evaded the issue.

It also appears that the Water Committee, after vainly trying to induce Mr. Hawksley to act *in conjunction* with Mr. Deacon, or, in other words, divide the responsibility with him, rather than lose his services yielded his point, as would appear from a letter to him on July 13, 1885, in which the Town Clerk stated: "The committee, however, desire me to point out that although both agreements contain the expression 'joint engineer,' this is by way of recital, and with reference only to the application to Parliament." Also, "that Mr. Deacon will continue to take the general and constant supervision of the works in consultation with you, and to discharge all the duties usually performed by a resident engineer." Mr. Deacon also offered to relieve the corporation from so much of their agreement with him as would remove the points of conflict. All this, however, was without avail, Mr. Hawksley insisting on the acceptance of his resignation.

So far as appears, Mr. Hawksley has ceased to act in an official capacity as engineer-in-chief since September, 1885, and, so far as we are advised, he has not yet been officially relieved from his responsibilities as engineer-in-chief by the council.

We have been at considerable labor and pains to lay before our readers the history of this important controversy, and in quoting from the correspondence we have, to the

best of our ability, abstracted so much as would give an impartial idea of the merits of the case. At the same time we have also quoted statements which, it seems to us, are valuable, as they affected the consideration of the management of engineering undertakings. Indeed, it is this latter aspect of the case which has induced us to surrender so much of our space to what at first sight may have appeared to some of our readers as mainly a personal controversy over a question of personal dignity. Finally, in reviewing the evidence in the case, the following appear to be the conclusions that may properly be drawn therefrom:

First—That Mr. Bower, in behalf of the Water Committee, himself, and Mr. Deacon, undertook an impossible task when he assumed to demonstrate that so great an undertaking could be carried out in which there should be practically two engineers-in-chief.

Second—The making of an agreement with Mr. Deacon in terms that involved a condition which Mr. Hawksley had all along absolutely repudiated and which was inconsistent with the agreement made with him was a practice that could have no other result than that reached if Mr. Deacon, as he did do, assumed the prerogatives his agreement conferred.

Third—Both engineers are entitled to consideration for having been made the victims of an attempt on the part of an indiscreet and too zealous friend of Mr. Deacon, to force him into the position of a professional partnership in spite of the protest, and for a time without the knowledge of Mr. Hawksley.

Fourth—That whether Mr. Deacon's judgment was or was not well founded in his criticisms of Mr. Hawksley's plans and specifications, this had nothing to do with the merits of the case in view of the responsibility imposed on Mr. Hawksley by the agreement made with him. Yet, under the agreement made with Mr. Deacon, he was not without justification in asserting his right to be consulted about details in the plans and specifications.

Fifth—That Mr. Deacon's ambition to be the engineer-in-chief, or even the "joint engineer," of the undertaking in which he had done so much preliminary work, was perfectly natural. Yet since the Liverpool authorities were at the time unwilling to intrust him solely with the former responsibility, and Mr. Hawksley, whom they did intrust with that responsibility, was unwilling to divide it with him, his friends should have accepted the inevitable and not attempted by the agreement made with him to place him in an anomalous position and one incompatible with efficient working.

Sixth—Mr. Hawksley has laid down a rule of action which is the only proper one in view of the dignity of his position as engineer-in-chief, his responsibility in "reputation and purse," for the sufficiency of his plans and specifications, and the imperative demands of discipline and efficiency; namely, a chief-engineer should be chief-engineer in fact as well as in name, or he should retire from the undertaking.

Seventh—The cause of all the trouble was the mistaken assumption on the part of the Chairman of the Water Committee, that in such an undertaking the problem of efficient joint control was solely governed by the question of "mutual consideration on the part of each engineer"—conflicting agreements to the contrary notwithstanding.

In conclusion, we desire to place on record the fact that, in the quotations we have made, and the conclusions we have reached, we have not the slightest desire to in any way reflect on or question the ability of Mr. Deacon as an engineer, or in any way pass judgment upon the criticisms made upon him by Mr. Hawksley; our only object being to, if possible, teach commissioners in this country how impossible it is to conduct harmoniously and efficiently engineering undertakings with more than one engineer-in-chief, with all that that implies.—ED. SAN. ENG.]

SOME DETAILS OF DOMESTIC ENGINEERING IN THE POTTER BUILDING, NEW YORK CITY.

(Continued from page 34.)

THE tanks above the eleventh story, into which the well-water is pumped for closet and urinal purposes, also receive all the rain-water from the roof of the building. As the pressure from these tanks would be too great for the ball-cocks in the water-closet cisterns, intermediary tanks are used on the ninth, eighth, seventh, fifth, and third floors to reduce the pressure. The eleventh and tenth story water-closets and urinal-tanks are supplied direct from the upper tanks. The ninth-story cisterns and flushing-tanks are sup-

plied from a large intermediary tank near the ceiling, which in turn is supplied by ball-cock from the high tanks. The eighth-story intermediary tank is supplied directly from the house-pump by a separate pipe, and it overflows into the intermediary tank on the seventh floor, which in turn overflows into the fifth-story tank, which latter overflows into the third story tank, and then to the basement tank, the tell-tale pipe being connected with the latter so that when

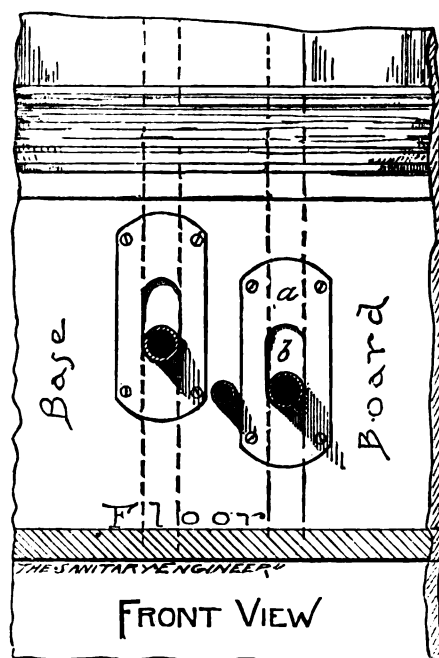


FIG. 2.

it shows water, all are filled. The tank on the seventh floor supplies that floor and the one below it, as do also the fifth and third story tanks the fourth and second stories respectively—the first or store floor having no closets.

In the building there are 56 water-closets and 37 urinals. The soil-pipe lines which run to the eleventh story are six inches their whole length, while those that run to the eighth story only are five inches. The ventilation-pipes are three

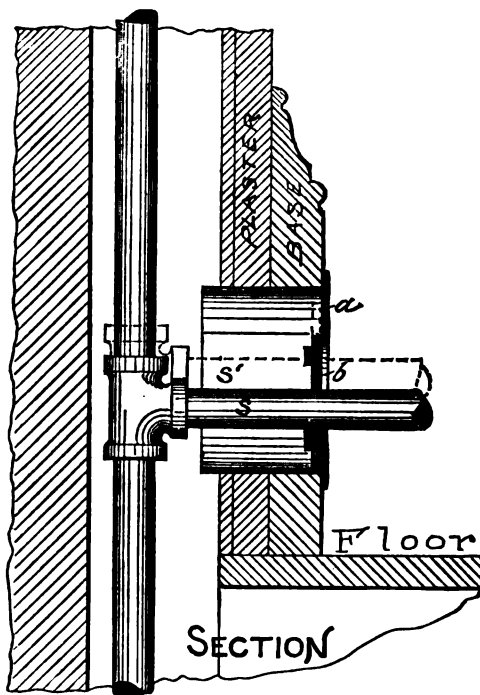


FIG. 3.

inches in diameter their whole length, with 2-inch back-air branches to traps, and a special feature of the ventilation-pipes is they have a "foot-vent"; in other words, air is admitted at the bottom of them so as to keep a circulation within them independent of what might pass from the soil-pipe and to secure less resistance to the passage of air to the traps on long lines for the purpose of anti-syphonage.

The basin-lines are three inches, with a 6-inch extension above the eleventh story, with 2-inch vent-pipe to the fifth-story fixtures and 1½-inch above, with air admitted below.

The heating of the building is by direct radiation; two 75-horse-power boilers and one 125-horse-power boiler are used. The latter is 70 inches in diameter by 16 feet long.

Arrangements are made to use the exhaust steam from the pumps and engines. Live steam is taken from the boilers through a 6-inch steam-pipe at high pressure, and reduced through a "Kieley" pressure-regulator to the desired back-pressure to be carried on the pumps, etc. This pipe joins with a large cylindrical separating tank, from which a 10-inch main goes to the house. A 7-inch main exhaust-pipe from all the pumps, etc., goes to the same cylinder. When the amount of exhaust steam is not sufficient for heating, and will not maintain the fixed pressure in the tank, the regulating-valve responds, and admits live steam until the pressure increases to the desired amount. All the return-pipes connect with this same tank or cylinder, within which a water-line is maintained, as all is below the boiler level, from which the water of condensation is pumped into the boilers by a "Blessing" pump-governor.

The rising lines are 146 feet long, 3 inches and 2½ inches in diameter at the bottom and 1¼ inches at the top. They are supported near their middle at the fifth floor within the recesses, and a special plate arrangement, designed by Messrs. Gillis & Geoghegan, shown in Figs. 2 and 3, has been used on the branches where they pass through base-boards or wainscotings. We believe it is technically called an "escutcheon," and is made of a face-piece, *a*, of cast iron, screwed to the base-board when it is to be of wood, but set with plaster of Paris when the base-board is of cement, and screws set

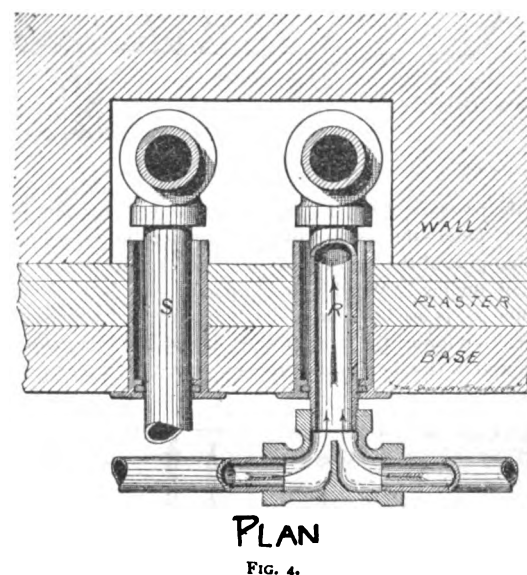


FIG. 4.

into lead fillets when of marble. It has a sheet-iron oval tube *s'*, which extends through the base and plaster, but the special point about it is the shutter *b*, which exactly fits the steam-pipe *S* and rises and falls with it, effectually covering the holes. Figure 4 shows the same in horizontal section.

Another special arrangement of fitting is shown in Fig. 4. It is a "partition" *tee*. It is used on the return-pipe when two radiators deliver their water into the same riser, and was made to obviate the backing of air or water into the opposing radiator. It was made at the instance of Mr. Edward Noonan, foreman in charge of the work, and can be fully understood by the illustration, Fig. 4, which is a horizontal section and plan through a "riser-recess" of the building, *S* being the steam-pipe, and *R* the return-pipe.

Four of the Otis hydraulic elevators are used in the building. Although the pressure from the open-tank system in this building is, presumably, as great as in any in the city, the makers use a compressed air-pressure of about fifteen pounds in addition.

This arrangement is shown in Fig. 5. The static head of the column of water from the surface of the water in the tank to the cellar is about 85 pounds per square inch. To this is added about fifteen pounds air-pressure so long as the tank is kept at its normal level, or, in other words, so long as the air is kept at that compression by the water being forced into the tank. This air, of course, is available for power only under compression, and should the pumps be stopped for a short time, and water drawn from the tank until the air was expanded to the pressure of one atmosphere only, then the water remaining in the tank would be available in a less ratio of pressure than that due to the head of water, as the air would become rarefied. To obviate this Mr. Q. N. Evans, an engineer of the Otis Company, designed the arrangement shown in Fig. 5. A safety-valve, *r*, is applied, made of a cup and a rubber ball-valve. This opens toward the tank, but, nevertheless, operates both

ways by the attached levers and float, so as to admit or let out air, so as to keep the supply constant. This is done by the float holding the valve open until the water reaches the height where compression should commence, and the slack chain allowing the ball to act as a vacuum-valve.

Figures 6 and 7 show an ingenious and simple contrivance devised by the same person for the purpose of preventing the starting of the elevator-car by the operator should the water in the upper tank become low. The chain *b'*, Fig. 5, is a continuation of the chain *b*, Fig. 6. When the water in the tank goes below what the slack of the chain is provided for, the pawl shown in elevation and plan in Fig. 7 is brought above a "slop" on the hand-rope, locking it until the tank is pumped up again. One of the elevators is arranged for hoisting safes. In this case,

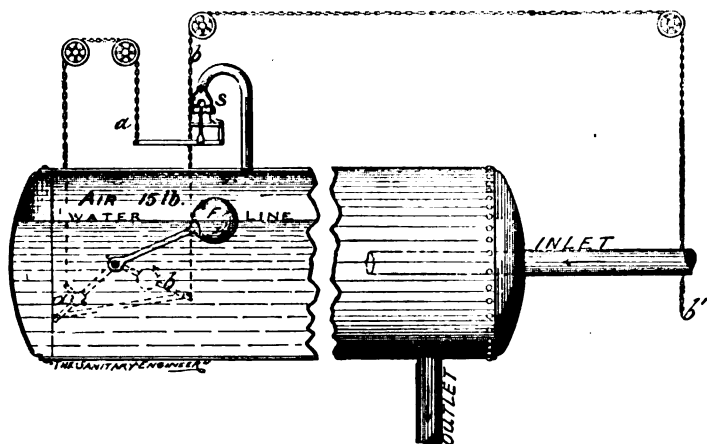


FIG. 5.

as the pressure of water from the tank is not sufficient for a very large safe, a stop-valve is introduced into the circulating-pipe of the hydraulic cylinder of the elevator, and a small duplex "Worthington" pump, with large steam-cylinders, is used to pump directly into the hydraulic cylinder. To lower, the stop-valve is opened and the water is allowed to circulate in the ordinary way, the surplus water finding its way into the lower tank.

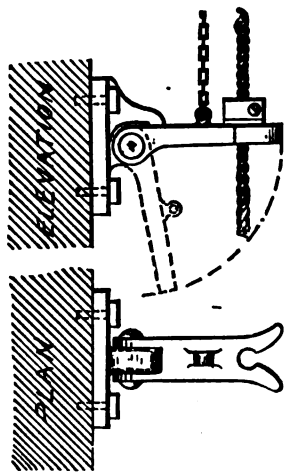


FIG. 7.

The architect of the building was the late N. G. Starkweather, whose superintendent and assistant was Mr. A. Belland.

The steam-fitters were Messrs. Gillis & Geoghegan, and the plumber the late M. J. Dunn, all of New York.

We are indebted to Mr. Wesley Randel, the engineer of the building, for information to enable us to prepare this description.

Correspondence.

SCHOOL ARCHITECTURE, HEATING AND VENTILATION.

WHITESBORO, TEX., June 9, 1886.

SIR: I have recently been informed that you published in THE SANITARY ENGINEER a letter that Mr. John T. Dickinson, of Austin, wrote you in reference to the department of "school architecture, also heating and ventilating apparatus." This is a department in our educational exhibit in connection with the State Teachers' Association. This enterprise is an experiment, so that we are anxious to make it a success.

As superintendent of the above-named department, I am very grateful to you for the publicity you have given our enterprise, and hope through your timely aid I may be able to secure some valuable contributions to my special department.

If you will be so kind, you may insert in the columns of your valuable paper that the State Teachers' Association of Texas will convene in Representative Hall, in the city of Austin, June 29, and that the committee-rooms and other rooms of the building as far as needed will be used for the educational exhibit.

The exhibit will be free and any contributions that any firm may make that will be of practical value to our teachers and that may bring such goods into requisition as would be most approved in "school architecture, heating,

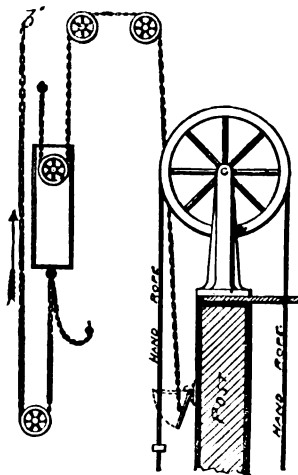


FIG. 6.

and ventilating." Plans, specifications, and samples are all desirable, will be very gratefully received, and cared for during the exhibition, then remain subject to the orders of the contributor when exhibit is over.

Mr. Jacob Bickler is Chairman of Committee of Arrangements, to whose care articles can be sent. Please send articles at once. Very respectfully,

MISS ELIZABETH MARCH.

PROGRESS OF THE PHILADELPHIA PLUMBING INSPECTION.

(From our Regular Correspondent.)

PHILADELPHIA, June 11, 1886.

SLOWLY, but apparently surely, are the movements forward toward perfection and full operation of the plumbing laws of the city promulgated by the Health Board. It has been impossible for months past for the friends of the measure, in the board and out of it, to have the Finance Committee even consider the appropriation asked for by the board to set the department in operation and pay the salaries of the necessary inspectors, and this tardiness so goaded the board in its earnest endeavor to carry out the direct statutory instruction of the Legislature, that it about determined to appoint the inspectors and then mandamus councils to appropriate sufficient money afterward. Accordingly the competitive examination was held and a chief and six inspectors appointed, and the action reported to councils. This action seemed to stir the councilmen to a sense of necessity for some action, for at the meeting of the Finance Committee, on Monday, June 7, the appropriation was taken up for consideration as well as the board's communication in reference to the salaries suggested by that body.

A very lengthy discussion was had on the proposed inspectorship and the kind of men necessary, and, finally, it was agreed to report the ordinance to councils, recommending the appointment of one chief inspector at \$1,300 per year, and four inspectors at \$1,000 per year each, and a clerk at \$1,000.

The board has placed three of the inspectors chosen by their body at work under the chief inspector, and they are now hard at work trying to cover those portions of the city where the most building operations are being performed, and, although every effort is being made to do so, the futility of attempting to fully inspect the plumbing-work of a city where there are 800 square miles of streets and with over 460 registered master plumbers with a force even much larger than that now at work is extremely apparent.

The necessity for the new department is also very evident from the work found by the inspectors in some of the sections of the city, cases being found in a few instances

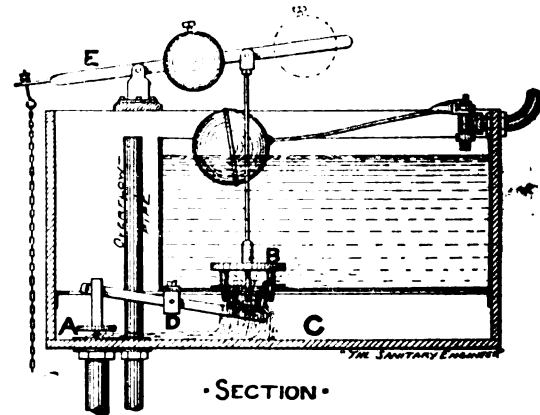
in which although plans were presented at the department and approved, as in conformity with the regulations, the work has been done in a manner not according to the plans and in direct opposition to the rules. In a few cases the work has been ordered done over, and in one large building the entire plumbing was overhauled. Numbers of plans have been presented that approval has been withheld from, and in several cases where the specifications had been prepared by some of our so-called best architects they displayed an ignorance of sanitary requirements that was truly surprising.

Novelties.

Under this heading we propose to describe and illustrate appliances of probable interest to our several classes of readers. The selection will be made without reference to the wishes of agents or patentees, being governed solely by considerations of novelty, ingenuity, and probable interest to readers, and especially the fact that they have not been elsewhere described. As a rule we shall make no comments, and it is to be distinctly understood that a notice does not imply approval. No charge will be made for these notices, and any offer of pay for their insertion will insure their omission. We shall be glad to have our attention called to novelties suitable for this section.

FLUSHING-CISTERN.

We illustrate what is called the "Novelty" cistern, to be used in connection with a seat attachment for flushing water-closets. It is the invention of Mr. J. E. Boyle, and is manufactured by Henry Huber & Co., of 85 Beekman St., New York City. It is designed to give a preliminary and after wash. When at rest the service-box is empty, the valve A being lifted by the depression of the lever C, on which a pin passing through the valve B rests. When the



seat of the closet is depressed, pulling down the weighted lever E, the valve B is lifted, and the water passes into the service-box. A portion of this escapes through A, thus giving the preliminary flush. The surplus flow of water into the service-box soon closes this valve by overweighting the lever which suspends it, and the service-box fills. When the lever E is released the valve B closes, pressing on the lever C and opening the valve A, when the contents of the service-box are discharged.

CINCINNATI INDUSTRIAL EXPOSITION.

A NEW series of exhibitions of art and industry will be inaugurated in Cincinnati, beginning September 1 and closing October 9. These are managed for and in behalf of the citizens of Cincinnati, who guarantee expenses by subscribing to an ample fund, by a board of commissioners, fifteen in number, chosen equally from the Mechanics' Institute, Board of Trade, and Chamber of Commerce. Their services are entirely gratuitous. The marked success of the Cincinnati expositions is due to their management. There are no stockholders, no dividends are declared, and no private interests are subserved. The last, or twelfth exposition, had exhibitors from twenty-nine States and four Territories, from several foreign countries, and was attended by 327,000 visitors. The exhibition of machinery in motion and the display of useful and artistic articles for purposes of construction will continue to be features. The Government, as usual, will maintain a post-office in the buildings, and ample accommodation is offered to intending exhibitors. Mr. L. H. McCammon is secretary.

BUILDING WATER-WORKS ON THE "INSTALLMENT PLAN."

OUR series of descriptions of recent water-works construction has brought us a letter, which we have read with some amusement, describing the processes by which a New England village, after a series of years, secured a public water-supply. It seems practically to have been on the "installment" plan.

The town of Easthampton, Mass., with a population of about 5,000, some fifteen years ago purchased of the Valley Machine Company, of that town, one of their bucket-plunger steam-pumps of a capacity of 400 gallons per minute, and laid that year 1,000 feet of 6-inch pipe through one of its principal streets, placing four hydrants along the line of this pipe. The pump was located at the works of the company which built it, the town agreeing to pay them \$2.50 per hour for the actual time the pump was run in case of fire. The cost for the first year for pipe-laying, pump and care of and running the same was about \$2,000. The next year an additional thousand feet of pipe was laid at a cost of \$1,000. The third year another thousand dollars was expended for pipe and hydrants. This brought the pipe past the front of the hotel of the town. The landlord applied to the Selectmen and engineers for the privilege of tapping this pipe and running a 1 1/4-inch pipe into his building, with ball-cock, etc., to supply his tank, putting a small steam-pump near the fire-pump and thus supplying himself with water. He argued that, as the town would be benefited by having the pipes filled in case of fire, he should not pay anything beyond the cost of running his own small steam-pump. This proposition was accepted. As the neighbors found that no trouble ensued from the hotel being supplied, they one by one applied for water, agreeing to share the expense with the hotel landlord in running the small pump. When the demand for water was beyond the capacity of the small steam-pump to furnish, the town decided to undertake the matter of supplying water for domestic as well as fire purposes; and subsequently a larger pump was secured, at a cost of \$500 per annum, to supply water for domestic and fire purposes, in addition to the regular fire-pump.

The pumping is done directly into the pipe, and the pressure in the pipes is from 80 to 100 pounds per square inch. The two pumps, although in different locations, are on the same level, and safety-valves on the water-pipes are set at 125 pounds, this pressure being sufficient for good fire-streams in any part of the town. There are now about five miles of pipe (4-inch and 6-inch) and about fifty hydrants. The largest sum expended in any one year was the first year, when the fire-pump was purchased.

We give the foregoing account of this method of securing water-works, not because we advocate this installment plan of securing what every town so imperatively needs, but because it is interesting as showing how a conservative community was educated up to the importance of possessing what at that period (fifteen years ago) was not so generally appreciated as it is to-day.

COMPLAINTS having been made that a powder company whose works are near Lake Hopatcong, New Jersey, were discharging acids into the lake and polluting its waters, the president of the company states that measures have been taken to prevent any escape of impurities into the lake, and that the company is "proud of its share of benefit to the locality," and is anxious to secure the impossibility of injury to the waters of the lake.

It is proposed in Salt Lake City, Utah, to build additional reservoirs higher up in the cañon whence the water-supply is derived, to furnish water to a plateau in the city which is now termed the "dry bench." A stand-pipe four feet in diameter and fifty feet high is also proposed, to which water will be led by a pipe laid still further up the cañon. The superintendent favors the use of wooden pipes for distribution.

In Dawson County, Tex., borings made by direction of some capitalists who sought information as to the possibility of obtaining underground water, showed that at a depth of 60 to 80 feet there is to be had a copious supply of good water, which can be raised by deep-well pumps driven by windmills.

[TOO LATE FOR CLASSIFICATION.]

CONSTRUCTION NOTE.

(By telegraph to THE SANITARY ENGINEER.)

PHILADELPHIA, June 15, 1886.

THE following bids were opened at the Water Department for one 20,000,000-gallon pumping-engine and foundations, or for two 10,000,000-gallon pumping-engines and foundations: For the first the bids were—Holly Manufacturing Company, \$69,000; Gordon & Maxwell Company, \$85,500, and also \$88,500; W. Cramp & Sons, \$72,330; R. Wetherill & Co., \$67,000; and H. R. Worthington, \$57,000. For the two 10,000,000-gallon engines, Gordon & Maxwell Co., \$42,500 and \$40,000; W. Cramp & Sons, \$81,140 (for both); R. Wetherill & Co., \$74,500 (for both); H. R. Worthington, \$71,500 (for both); and T. P. Morris & Co., \$87,900 (for both). All bids referred.

Gas and Electricity.

Illuminating Power of Gas in New York City.

Week ending	New York Gas-Light Company.	Manhattan Gas-Light Company.	Metropolitan Gas-Light Company.	Mutual Gas-Light Company.	Municipal Gas-Light Company.	Krickerbocker Gas-Light Company.	Equitable Gas-Light Company.
June 5.....	26.05	18.85	21.82	31.04	30.11	23.78	32.49
June 12.....	25.22	19.32	22.30	29.73	29.55	23.69	33.06

E. G. LOVE, Ph.D., Gas Examiner.

TO PREVENT ACCIDENTS IN MINES.

A RECENT number of the *Journal of the Society of Arts* contains some abstracts from the final report of Her Majesty's Commissioners appointed to inquire into accidents in mines.

The report calls attention to the importance of examining all mines by means of indicators capable of detecting as small a proportion as one per cent. of gas, such examination to be made before the commencement of each day-shift. The use of safety-lamps is recommended in all dry mines where the air may contain coal-dust, or where fire-damp is known or suspected to exist. Referring to the different safety-lamps, the commissioners state that the ordinary Davy lamp becomes unsafe before a velocity of 400 feet per minute is attained. The ordinary Clanny lamp will almost certainly cause an explosion in a current having a velocity of 600 feet per minute, while the Stephenson lamp will frequently cause an explosion in a current of 800 feet per minute. Currents with velocities of over 400 feet per minute are frequently found, and those approaching 2,000 feet are on record.

Four lamps are mentioned as combining a high degree of security with fair illuminating power and simplicity of construction. They are Gray's lamp, Marsant's lamp, the bonneted Mueseler lamp, and Evan Thomas's modification of the bonneted Clanny lamp. The best results were obtained with the last-mentioned lamp.

The commissioners favor the use of glow-lamps as auxiliary lights, but say that as they do not afford any indication of the condition of the atmosphere in a mine, their employment, even if special fire-damp detectors are used, cannot in any case dispense with the necessity for the use of some safety-lamps.

THE output of coal in the United Kingdom in 1885 was 159,351,418 tons, in which 520,632 colliers were engaged.

A SYNDICATE of Chicago capitalists has applied for an exclusive franchise to lay mains in the streets of Appleton, Wis., for supplying natural gas from a well which it is proposed to sink.

CONTRACTS for lighting the streets of Camden, N. J., have been awarded to the Camden Gas-Light Company at \$25 per gas lamp per year, and to the Pennsylvania Globe Light Company at \$22 per gasoline lamp.

A COMPANY, known as the Gas Consumers' Company, has filed articles of incorporation at Albany. The purpose is to furnish gas in New York at \$1 per 1,000 cubic feet. Among the incorporators are: John H. Sherwood, President of the Gas Consumers' Association, Russell Sage, and Henry Hilton.

THE Gas Consumers' Association of New York has obtained from the Attorney-General of the State an order requiring the Consolidated Gas Company to appear at Albany on the 22d inst., in answer to an application for the appointment of a receiver and the winding up of its affairs. The ground alleged is irregularity in the passage of the act authorizing the consolidation.

THE Imperial Continental Gas Association recently held its half-yearly meeting in London. The association has a capital of about \$14,000,000, with works at Amsterdam, Rotterdam, Antwerp, Brussels, Berlin, Hanover, Vienna, and other places. The report of the directors states that the quantity of gas made in the half year ending December 31, 1885, was 3,694,000,000 feet—an increase of about 6 per cent. over the corresponding period of 1884. There were 122,243 consumers on the books of the association, and the entire length of mains laid was 1,547 miles.

THE *Elektrotech. Zeitschrift* of April, 1886, says that lately the Brothers Siemens have been manufacturing glow-lamps, whose glasses are filled with hydrogen. It had been remarked before that glow-lamps in which the inner glass wall had been rendered brown could be cleaned by filling them with hydrogen and then exposing both the carbon filament and glass to a high temperature. These lamps are said never to become brown at all, and to last longer. They can be used with higher electro-motive forces, and consequently under conditions considerably more favorable to economy, without diminishing their wear. It is thought that many evils which are found in the vacuous glow-lamps now in use will disappear when the carbon filament is in an atmosphere of a gas exerting considerable pressure, but not acting chemically upon it.—*Electrician*.

NOTES.

IN Montreal, Can., the cost of repairing main sewers in 1885 was \$10,589.24, according to the report of Superintendent St. George, of the Street Department. The repairs of old and defective lateral sewers cost \$3,584.27, the construction of catch-basins \$9,791.68, and the construction of 16,428 feet of lateral sewers \$40,140.68. Mr. St. George advocates the construction of an intercepting sewer to take the drainage of 3,030 acres and discharge it into the river directly, without passing through the low-level system, where the sewage in flood times has to be pumped.

AN epidemic of typhoid fever is prevailing at Bellaire, O., due, it is supposed, to a pollution of the river-water by the sewage of Wheeling, W. Va.

THE first examination of candidates for the offices of Municipal Engineers and Surveyors, under the auspices of the London, Eng., Municipal and Sanitary Engineers, was held at the Institution of Civil Engineers. The examination was *viva voce* and written, the examiners being Messrs. R. Vawser, M. I. C. E., (President); W. G. Laws, M. I. C. E., City Engineer of Newcastle-on-Tyne; Clement Dunscombe, M. A. M. Inst. C. E., City Engineer of Liverpool, and Ellice Clark, of Hove. Nineteen candidates presented themselves, and certificates were granted to the following: J. A. Angell, of Leytonstone; H. Ashmead, Clifton; H. G. Coales, King's Lynn; W. C. Fenton, Sheffield; A. D. Greatorex, Toxteth Park; A. Harland, Charlotte Street, London, W.; F. Osborne, Dover; C. E. Saunders, Walthamston; J. W. Witts, Skelton-in-Cleveland.

DAVID VAN NOSTRAND.

THE death of David Van Nostrand, one of the most widely known American publishers of scientific books, occurred on Monday, in this city, in his seventy-fifth year. From the age of fifteen he had been almost constantly connected with the book-selling and book-publishing business. His first partnership was with William B. Dwight, which was dissolved in 1837. Some years after he opened a book store at Broadway and John Street, in this city, and, finally, entered upon the special line of the publication of scientific books, removing, in 1869, to Murray Street, the present location. Mr. Van Nostrand leaves a widow but no children.

THE last stage of a case in which summary action was taken by the local sanitary authority, reflecting credit on on the local board at Coventry, Eng., and its Sanitary Inspector, Mr. Booker, has just been reached. The inspector having reported that certain closet accommodation on the premises of a Mr. T. Beech was a nuisance, the said Mr. Beech had notice to abate the nuisance, substituting water-closets with proper flushing-apparatus for the old privies. Failing attention on the part of Mr. Beech, the sanitary authority took the matter in hand, did the work, and, under Section 36 of the Public Health Act, took summary action to recover cost of same—some £21 (\$100.80). Beech appealed to the Local Government Board against this step, and an inquiry under a Government inspector was held, the appellant's position being that he was not liable for the sum, he having an objection to water-closets, and holding that earth-closets would have been efficient and should have been used. The local authorities' contention was that water-closets were the proper things in this instance, and the ruling of the Local Government Board has upheld the view of the local authority. Common sense should dictate to Mr. Beech that if every one were permitted to carry out his own "crank" in sanitary matters, overruling the powers of the various local boards, the work of such boards would be simply impossible to carry through.

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THE SANITARY ENGINEER.

DEVOTED TO

ENGINEERING, ARCHITECTURE, CONSTRUCTION, SANITATION.

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ZINC IN DRINKING-WATER.

THE London *Lancet* of April 24 contains an account by Dr. John Ward of an outbreak of colic on a steamship which he attributes to contamination of the water-supply by zinc derived from zinc plates fixed in the boiler from which this water was condensed. It appears that the intention had been to renew the water-supply of the ship at Batavia, but that this was not done from fear that the water at that port was contaminated by cholera contagium, and the supply for the remainder of the voyage was obtained by the distillation of sea-water. On testing the water it was found to contain zinc.

This brings up the questions, which have been frequently asked and never definitely and satisfactorily answered, as to whether the compounds of zinc taken up from the surface of that metal by drinking-water can be of such a character and quantity as to make the use of the water dangerous to health or life, and as to the circumstances under which such dangerous contamination may occur.

The matter has been several times investigated, chiefly with reference to the possible risks of the use of zinc-lined cisterns, or of galvanized-iron pipe, and the result has been the declaration by chemists and sanitarians that these risks are very small. An elaborate paper on this subject by Dr. W. E. Boardman, of Boston, was printed in the fifth annual report of the State Board of Health of Massachusetts for the year 1873, and in THE SANITARY ENGINEER, Vol. V., page 476, is given a communication from Professor William Ripley Nichols on the same point.

Zinc is taken up by water from galvanized-iron pipes, sometimes very rapidly, and in any case the zinc coating is often removed in the course of a few years. The zinc forms an oxide, and then, with ordinary waters, a carbonate. These are not very soluble in water, and tend to form a protective coating in the metal, but are easily detached by a strong current and pass out held in suspension sometimes in such amount as to give a milky tinge to the water. But the oxide and carbonate are not usually reckoned as poisonous. The oxide has been repeatedly given in doses of twenty grains a day, continued for a month or more, without producing any particular effect. The poisonous salts of zinc are the chloride and the sulphate, but we do not know of any case in which these have been found in drinking-water in quantity sufficient to produce deleterious effects.

Water drawn from galvanized-iron pipes has been suspected of producing disease, but in these cases it seems very likely that the water would have done the same if taken before it entered the pipes. It is possible that the impurities of some zinc rather than the zinc itself have produced trouble, and this seems the most probable explanation of the epidemic of colic reported by Dr. Ward. If the zinc plates placed in the boilers contained a considerable quantity of lead, which is quickly attacked by distilled water, the colic is not surprising.

FORESTS AS SANITARY AGENTS.

IN the progress of the increase of population in a country, more especially under those circumstances which, taken in the aggregate, we call civilization, there must be more or less interference with natural surface topography. Man is a great disturber of things, and, unfortunately, the changes which he brings about are not always for the better. Among these changes, some of the most important, both in their immediate and in their remote results, are those connected with the destruction of the forests with which large portions of the earth now comparatively or entirely bare of trees were once covered. As population increases, the need of food-supply requires that forests shall give way for agricultural purposes, and a certain amount of destruction is therefore inevitable; but no one who is familiar with the process of stripping the hills and valleys of their natural growth of trees, which has been going on with an accelerating ratio in this country during the present century, can doubt that much of this has been unnecessary, that we have been prodigally wasting our inheritance, and that it is high time that steps were taken, not only to prevent further unnecessary destruction, but also, by systematic planting, to repair some of the damage which has been already done.

The presence of forests modifies the climate in their immediate vicinity, tending to prevent extremes of temperature, and often of moisture, and in this manner they may affect the character and severity of the diseases of a particular locality. They protect from violent winds, and, to some extent, from malarial influences.

Their influence upon temperature is to prevent wide variations between day and night, such as occur upon desert and arid plains; they store heat during the day and radiate it slowly at night.

But it is not only to localities in their own immediate vicinity that forests are important. Their value is perhaps even greater to distant regions, the water-supply of which they regulate and control. This regulation is effected, not so much by any great influence exerted by them upon the total amount of rainfall in their vicinity, or by any effect which they produce upon the total annual evaporation from the surface which they cover, as it is by the fact that they tend to form, by their roots, the plants which flourish in their shade, and the collection of dead leaves, etc.—a sort of huge sponge which retains for a time the water falling upon it, and afterward gives it off gradually, supplying springs and streams. In this way they tend to prevent great variations in the size of streams flowing from them, and thus to avert floods and droughts; they are the regulators of the water-supply of distant places lying at lower levels in the drainage areas in which they flourish.

In view of these facts, it is evidently important that those parts of the country where culture is either impossible or unprofitable shall be devoted to trees, that a watchful care should be exercised over these regions to prevent unnecessary and

useless destruction of the timber by fires, etc., and that the systematic planting of trees to replace those taken for manufacturing purposes should be encouraged as far as possible. This planting of trees must in fact become in this country a commercial necessity at no very distant day, for the prices of the lumber needed for our houses, furniture, and for the transportation of goods will before long rise to such a point as to make tree culture a profitable and essential branch of industry.

OUR BRITISH CORRESPONDENCE.

The Norwood Sewage-Farm Inquiry—The Native Guano Company Patent Infringement Suit—Tall Chimney at the Mechernicht Lead-Works.

LONDON, June 5, 1886.

AN inquiry now being held by a Government Inspector on the projected extension of the Norwood Sewage-Farm is an opposite comment upon the address of Dr. Carpenter

solids from the liquid, which then run on to the land, filtering over and through (sometimes) five fields before the effluent runs away. The solids left behind in the screen or filter-house are dug out, and, after being mixed with ashes, are used for manuring fields for the mangold crops. That portion of Mr. Figg's evidence referring to the cemetery adjacent to the farm should receive attention at the hands of the borough authorities. He stated that the cemetery superintendent's house drains into a cesspool, such cesspool being in communication with the water-course running along the farm by a drain. Referring to the common graves at the lower end of the cemetery, he stated that they were often left open from six weeks to two months waiting for a second interment; that in the interval they become full of water, which had to be pumped out into the water-course, and that the smell of this liquid was strong and offensive. Apart from other considerations, the facts, if they are as stated, are a gross offense against common decency, and an unnecessary and cruel want of consideration toward the feelings of the relatives of the dead, who are of the pauper class.

but that in the town and immediate suburbs they will not look at it. Sweepings of cattle-trains, etc., are sold there at 2s. (48 cents) a ton, and slaughter-house sweepings, manure offal, etc., apart from blood, fetches about the same.

There has recently been completed at the Mechernicht Lead-Works (Germany) a chimney-shaft the height of which is probably unequalled in the world. Taking into account the eleven feet of substructure, the total height over all is 440 feet. The base is thirty-four feet square to a height of about thirty-four feet, where the shaft changes to octagonal, thence to circular, tapering to 11½ feet. The flue graduates from 11½ feet at bottom to ten feet at top.

SAFETY-VALVE.

OUR SPECIAL ILLUSTRATION.

A RESIDENCE AT BEVERLY FARMS, MASS.—HARTWELL & RICHARDSON, ARCHITECTS.

THE country house of which we give two views this week is the residence of Thomas E. Procter, Esq., at Beverly

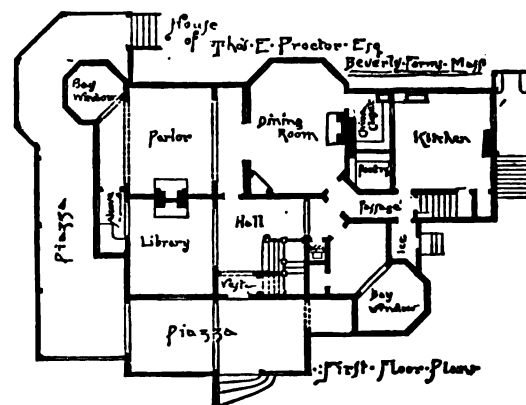


A COTTAGE AT BRYN-MAWR, PA.—FURNESS & EVANS, ARCHITECTS.

to the Association of Sanitary Inspectors. The Croydon Corporation are desirous of obtaining Parliamentary powers for raising a loan of £47,593 (\$228,446.40) for the purpose of acquiring further land to extend their Norwood Farm. A great number of the inhabitants of the neighborhood are offering the most strenuous opposition, on the grounds that the present farm is already a nuisance and injurious to health, and that its extension will, of course, increase this nuisance. Mr. Walker, the Borough Engineer, in his evidence, stated his opinion that the land now proposed to be purchased would be sufficient at least for twenty years, and that if then sold it would fetch more than its present value. He showed that the alternative scheme most favored—namely, the connection with the West Kent scheme of sewerage—would entail large increased cost on the rate-payers, and denied the existence of the alleged existing nuisance, which would, of course, be the only justification for incurring the extra expenditure. The farm manager, Mr. Figg, in his evidence, stated that the chief flow of sewage was from 10 A. M. to 2 P. M. The process of using the sewage he stated as follows: It is received on the farm through a screen, which separates the

Judging from the fact that a case has just been heard before Vice-Chancellor Bacon, in which it was sought to restrain the defendants from making and offering for sale manure made from town sewage under the name of "native guano," it would appear that the trade in such manure is acquiring additional monetary value. Hitherto it has hardly been looked upon as very lucrative business. The plaintiffs were the Native Guano Company, Limited, the patentees and proprietors of the A. B. C. system of sewage disposal, the main feature of which is, of course, the rendering of the sewage into a serviceable form for use as manure. The defendants, trading as the Sewage Manure Company, advertised and circularized an article of their own manufacture as "the native guano and soot manure." The Vice-Chancellor granted the injunction asked for. The plaintiff-company stated that they had expended upward of £160,000 (\$768,000) in the acquisition of the patents. They have unquestionably fought an uphill fight with great determination, and seem to be entitled to the protection of their trade-mark name. In this connection I may say that the Borough Engineer of Belfast states that the farmers up-country will use this form of manure readily,

Farms, Mass. It is not a new house, but was enlarged and reconstructed at a cost of about \$22,000, from designs



by Messrs. H. W. Hartwell and William C. Richardson, architects, of Boston.



THE SANITARY ENGINEER ILLUSTRATED SERIES.

A RESIDENCE AT BEVERLY FARMS, MASS.

HARTWELL & RICHARDSON, ARCHITECTS.

OUR ILLUSTRATION OF A MODERATE-COST HOUSE.

A COTTAGE AT BRYN-MAWR, PA.—FURNESS & EVANS, ARCHITECTS.

THIS cottage is the residence of Mr. William T. Tiers, at Bryn-Mawr, near Philadelphia. The lower story is of stone, half-timber work filled in with plaster being used above. The house cost about \$7,000.

The architects are Messrs. Furness & Evans, of Philadelphia.

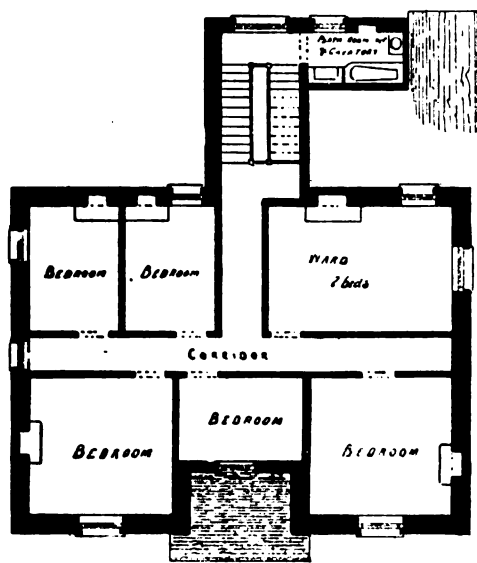
COTTAGE (SMALL) HOSPITAL CONSTRUCTION.

BY HENRY C. BURDETT.

Author of Cottage Hospitals, Pay Hospitals of the World, etc.
No. VII.*

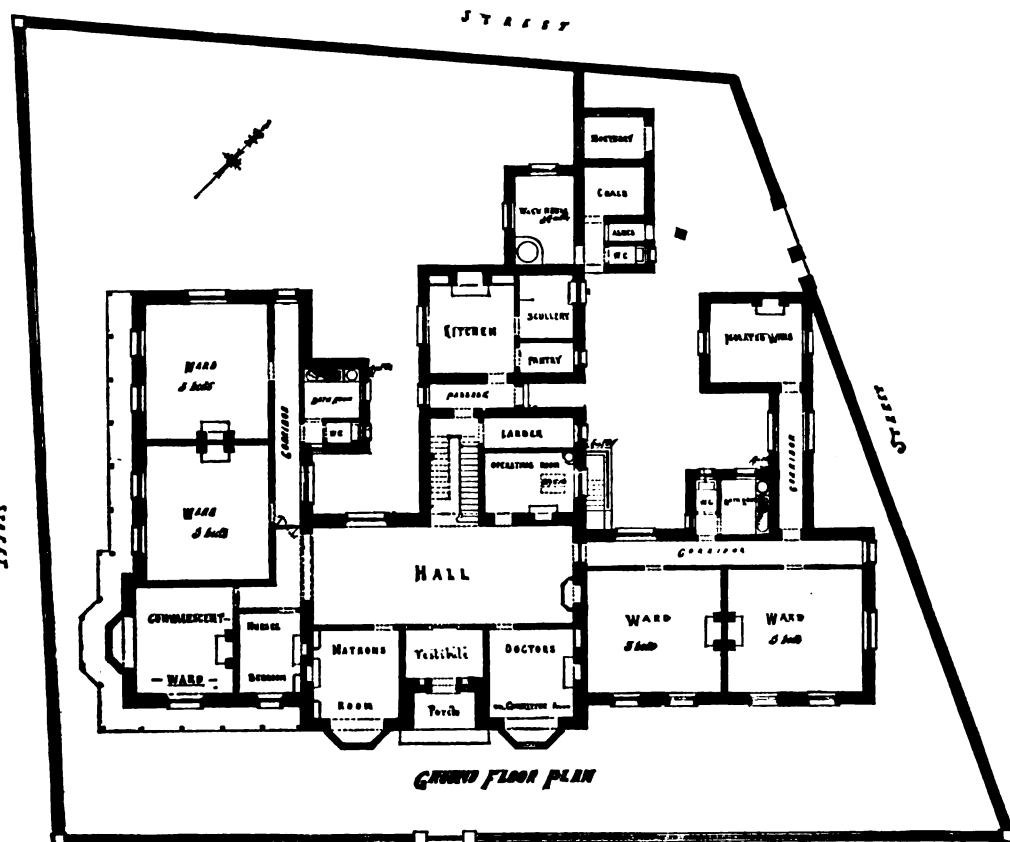
COTTAGE HOSPITAL, LLANDUDNO.

THE site for this hospital is somewhat curious, being surrounded on all four sides by streets. The principal front faces south-east, and all the wards have either a south-east or south-west aspect.



SECOND STORY PLAN.

* No. VI., the Sister Dora Convalescent Hospital, Milford, Stafford, was illustrated in our issue of May 27, 1886.



GROUND FLOOR PLAN

The entrance vestibule leads into a large hall, 42'x16', which apparently serves no other purpose than that of a passage. On either side of the entrance is a room, one of which is matron's sitting-room, the doctor's or committee room.

The wards are rooms only entered from narrow corridors, and lighted and ventilated on one side only, and give a superficial area per bed of 86 feet. The form of the rooms and the disposition of the windows make a suitable arrangement of beds a matter of extreme difficulty, if not impossibility.

On the opposite side of the corridor, but not otherwise isolated, are the bath-rooms and water-closets, one of each to two wards. On one side of the building is a small isolated ward approached by a cross-ventilated lobby.

The operating-room is placed on one side of the large hall, and is as small as it well can be. Next to this is the larder, and beyond, but separated by a lobby with through ventilation, are the kitchen offices. The mortuary is well screened from the view of the wards, but the means of approach to it are very defective. According to the plan, a body from any one of the wards would have to be carried through the large hall past the larder and kitchen offices before it could reach the mortuary. This arrangement is obviously objectionable, and, by simply converting two of the corridor windows into doors, could be easily rectified.

A small ward for two beds and five bedrooms for staff are placed on an upper floor over the central portion.

THE LATE FREDERICK B. WHITE.

THE Architectural League of New York has entered the following upon its minutes and for publication:

"The Architectural League of New York is, with sorrow, called upon to record the loss of a gifted and promising member, Frederick B. White, whose high ideals and singularly bright and attractive nature had earned for him the respect and affection of those who knew him. While yet a student at Princeton College, and without any special architectural training, he gave indications of unusual fitness for the profession he chose, and into the independent practice of which circumstances forced him at an earlier age than he would himself, perhaps, have chosen. At the age of 25, and only three years after he had bid adieu to his Alma Mater, he had already designed and executed, besides many smaller buildings, a number of important works, the excellent qualities of which seemed to promise a brilliant future. In his death the profession loses a prac-

itioner who took a serious and lofty view of his art, and the League a brilliant member.

"The League desires to express its sincere sympathy with Mr. White's family in their bereavement."

STANDARD THREADS FOR WROUGHT-IRON STEAM AND GAS PIPES.

THE Committee of the American Society of Mechanical Engineers on "Standard Threads for Wrought-Iron Pipe" met a committee of manufacturers of wrought-iron pipe, appointed by the Pipe Manufacturers' Association, at the Fifth Avenue Hotel, in New York, on the 17th inst., for the purpose of considering the question of adopting the Briggs standard or some other equally good standard by the manufacturers of wrought-iron pipe, so that all who make pipe will be able to furnish a common and interchangeable standard.

The gentlemen representing the manufacturers were: L. H. Shallcross, representing Morris, Tasker & Co., of Philadelphia; Mr. J. H. Flagler, of the National Tube-Works Company, of New York; Mr. L. J. Piers, of the W. O. Allison Manufacturing Company, of Philadelphia; and Mr. J. H. Murdock, of Pittsburg, Secretary of the National Pipe-Manufacturers' Association.

Those of the committee of the American Society of Mechanical Engineers were: Mr. George M. Bond, of the Pratt & Whitney Company, of Hartford, Conn.; Mr. Frederick Grinnell, of the Providence Steam and Gas Pipe Company; Mr. George Schuhmann, of the Reading Iron-Works; and Mr. William J. Baldwin, M. E., of New York.

An informal discussion first took place, in which it was apparent that the manufacturers were anxious to co-operate with the mechanical engineers in securing some uniform standard. As it now is, the manufacturers make so-called standard pipe, and keep as near to each other's standards as it is possible for anything to be that has nothing to regulate it but custom. The result is a lot of standards, or, in other words, many approximations to the Morris & Tasker standard as originally established.

The late Robert Briggs proposed a formula for a standard, which is supposed to be somewhat identical with the Morris, Tasker & Company's standard when applied to pipes with the usual number of threads to the inch. He also proposed a change of pitch of threads to conform to his formula, but he realized that this would probably be impracticable.

The proposition now on the part of the committee of the American Society of Mechanical Engineers is to adopt this standard if possible, as it is founded on good principles, the full particulars of which are to be found in the issue of THE SANITARY ENGINEER for April 12, 1883.

After the discussion, Mr. Flagler proposed the following resolution on the part of the pipe-manufacturers, which was seconded by Mr. Grinnell, and carried: "That each manufacturer send to the Pratt & Whitney Company, at Hartford, sample-pieces of their pipes from six inches down, threaded on one end, for the Pratt & Whitney Company to test and compare with the Briggs standard, of which they have made standard test rings up to four inches, and have them report to each manufacturer the state of his own gauges as compared with the Briggs standard, and the secretary be directed to notify the manufacturers, and request them to comply with this resolution, so that further action be taken at the next meeting on July 20."

THE farmers of Ontario are interesting themselves in a scheme for the general drainage of wet lands to be undertaken by the Provincial Government, or at least executed by the aid of funds advanced by the Government, on security of the farms, at a low rate of interest.

TWO MEN were asphyxiated last week in the tunnels of the new Croton Aqueduct. Dr. Edson, of the New York Board of Health, has begun an investigation into the condition of the tunnel's ventilation and air.

AN appeal will be made very soon to the Governor of New York State to take action against the Hunter's Point stench nuisances. The regularity with which these nuisances break out suggests, "About this time of the year look out for stench."

THE Joint Board of Jersey City and Newark on Water Pollution has issued a proclamation threatening to punish all persons polluting the waters of the Passaic River.

SOME OFTEN NEGLECTED DUTIES OF THE ENGINEER.*

BY F. COLLINGWOOD, M. A. S. C. E. AND M. INST. C. E.

IN a recent address before the Institution of Mining Engineers the subject of ethics, as bearing upon engineering practice, was treated with some fullness by the retiring president, Mr. Baylis. It is not my intention to repeat what he has so well said, or to take up the more obvious duties which are so often brought forward in addresses at the commencement season. Such addresses usually treat of those qualities which form the foundation of the character of every really successful engineer, and more especially of the necessity for that absolute honesty of purpose in every relation he holds, whether as designer, as supervisor, or as arbitrator, which alone can lead to the thoroughness of work, and which at once places him on his guard against any dishonest approach, however it may be disguised.

Entering, then, upon our subject and proceeding from the lesser to the greater, let us consider first the relations of the chief engineer of an important work to the members of his staff. As a matter of course he expects absolute loyalty on the part of all those under him, and any disloyalty would probably end in the prompt dismissal of the offender. How shall such loyalty be obtained? Shall it be the result of fear, or shall it be bred of mutual regard and confidence? In other words, is the duty *all* on the part of the subordinate, or is there a reciprocal obligation implied on the part of the chief? If the latter question be affirmatively answered, as it must be, let us proceed to state clearly what the obligation is. Here we should remember that the most eminent engineers have all been subordinates, and have had the help of others by which to rise. As an inevitable corollary upon this, it follows that the chief owes it to all in his employ to help them freely in their difficulties, and to be readily approachable. By thus doing he will make them stronger men professionally, and help forward his own success. Our first duty, then, may be defined as that of politeness, affability, and a personal regard for subordinates. Mr. H. H. Richardson, of Boston, the well-known architect recently deceased furnished a prominent example of one who nobly fulfilled this duty. In a notice of his life-work THE SANITARY ENGINEER writes as follows:

"Nor less delightful than this office in the country was Mr. Richardson's relation to the draughtsmen he employed. Only those who have had the privilege of working under him can have much idea of the generous interest he took in their welfare and artistic progress, encouraging them and advising them in their studies, and ever ready to listen to intelligent suggestions, treating his men as personal friends rather than employees. Often he would invite a number of his older pupils to evening reunions, where he would talk over with them matters relating to their art. His valuable library and collection of photographs were always accessible to his draughtsmen, and he encouraged their constant reference to them. Few men have such power as he had of filling others with his own enthusiasm."

There is a second way in which the chief can help those under him, but to which selfishness often blinds his eyes. It frequently happens in the progress of a work, that the one coming in immediate contact with some of the many problems involved will bring out a solution or work up a design having real merit. The credit for such design does not belong to the chief, and as a matter of simple justice, he should, in making up his reports, give full credit to the designer; yet, in many cases this is not done at all, and the assistant is mentioned in merely general terms and with no reference to his special work. This is not the way to obtain whole-hearted service; a chief engineer can *always* afford to be generous to his helpers. A full acknowledgment of all good work, no matter by whom done, in no wise detracts from his own standing; on the contrary, the world will think the better of him for it. The work is always known afterwards as that of the chief, and if he adds generosity to his other qualities, he will but stand the higher in the estimation of all thinking men. It is said, that one great reason for the popularity of General Grant was, his generous treatment of all those under him.

There is yet another duty of the chief, which has much to do with a hearty, loyal helpfulness on the part of subordinates. In the inception and progress of a work, it is he who in a great measure determines the respective salaries to be paid to the other members of his staff. The vicious doctrine that no more will be paid than the market will command, with no regard for the cost of living or for the character of the services rendered, too often prevails, and many men seem to think that if *they* are insured a good salary, it is laudable to cut the salaries of all below them down to the lowest attainable limit. It is only necessary to carry this doctrine to its ultimate conclusion to prove that it is both unjust and unwise. If we want a horse to do his fullest work we do not begin by scanting him in his food, but we give him full provender and the best of care. Are men so different that we can expect them to do their best when they are but half paid for their labors? Is there not sure to be in their minds a rankling sense of injustice? If an assistant so paid be too honest to slight his work, he will still be preoccupied by thoughts of "how to make both ends meet" in his expenses, or how to be able to meet just debts, possibly those incurred in obtaining the education which has fitted him for the very thing he is doing, and, as we all know, a preoccupied mind is not fitted for deep or consecutive thought on any subject. The chief should therefore insist at the outset upon full compensation for all services rendered, and should be

the first to recognize good and faithful work, by asking for such increase in salary as may be consistent with its value. A man who lets neither time, study, labor, nor expense interfere with his attention to his duties, is certainly worth more than one who works always by the clock (trades unions to the contrary notwithstanding); and a worthy man should not be obliged to ask for that which is rightly his due.

In immediate connection with the subject of organization of a staff arises that of a proper recognition of the relative positions of subordinates; by this is meant the military idea that orders shall be issued and reports received always through those next in rank, and not, as is too often done, with an entire disregard of precedence or system. An engineer has a right to suppose that each one in his place is attending to his duties, and to pass over the one next below him and give an order to a minor, implies a lack of confidence in the first, is likely to cause insubordination in the second, and is sure, eventually, to introduce confusion and ill-feeling in the staff. Having placed a man in position he should be held strictly accountable for all work entrusted to him, and if found unfaithful he should be removed; but to pass him by and ignore him, whether by attempting to do the work personally or by assigning it to others, is an evidence of weakness, and is doing one wrong to mend another.

Such abuse of good management is, however, often committed where no *fault* is attributed; in which case it shows a lack of sound ideas as to administrative methods, and is still to be unqualifiedly condemned. Not only does it introduce discord into the service, but in just so far as a man misdirects the labors of those under him and relieves them of their due share of responsibility, does he injure his own efficiency and make his own labors heavier. Here it may not be amiss to quote with proper reservation the advice that has been given engineers to "never do yourself what you can get others to do for you." In a recent obituary notice of a prominent English engineer the following sentence appropriate to the case in point occurs: "The confidence reposed by Mr. Leather in his staff, and the freedom with which its members were thus enabled to grapple with the many sudden emergencies inseparable from sea-works, were also important factors of his success in these undertakings."

It not unfrequently happens that Boards of Direction and other employers show a lack of this confidence in their chief engineer, and are guilty of the gross impropriety of attempting to give personal directions to assistants, or of receiving reports from them.

The practice cannot be too strongly reprehended. It is an axiom in physics that two bodies cannot occupy the same place at the same time, and it is no less true that two persons cannot attend to one and the same set of duties at once. Confusion is inevitable. "Dual control" is bound to be a failure wherever undertaken.

With the profession as a whole, as in the engineering family, the golden rule should equally guide our actions. Perhaps one of the first ways in which this rule is violated, is in passing judgment upon the works of others, in the way of fault-finding and belittling them, picking flaws, making small criticisms of design or methods, etc.

Does any engineer imagine he raises himself in the opinion of others by so doing, or in any way advances his own prospects of success? It cannot be: the world is, on the whole, fair in its estimate of men; it recognizes and appreciates the generous everywhere, and is just as sure to condemn the opposite. Criticism for the purpose of suggesting improvement is a good thing, but criticism for any other purpose is unworthy a true man. The best of men make mistakes, and are made stronger and better by them, and they suffer quite enough mortification from self-condemnation without the animadversion of men frequently of less calibre or purity of purpose. It has been laid down as a rule that the man who has never made a mistake must have had so limited an experience in work that he is not a safe man to trust.

But the subject of professional honor and generosity leads us to a second thought—we are bidden on Divine authority to look upon "the things of others" as well as our own; and this will lead us to hold to a high standard in the matter of engagements.

It is, of course, unprofessional as well as ungentlemanly to do anything to undermine another for the purpose of supplanting him; but I think we may go a step further, and say, where a man has been wrongfully discharged because he would not be made a tool of, either in the way of deceiving the public by doctored reports, by winking at dishonesty in whatever form, or for any other disreputable purpose, we may, indeed we *should*, refuse to accept such position, and so uphold our brother in his protest. As a matter of right, also, an offer should not be entertained for the position filled by another, unless his resignation has already been announced. In other words, if the profession is ever to assume its true dignity as a profession, we must never on our part do aught to bring it into discredit, and we should resent the idea that is held by many, that engineers are tools, or a commodity to be bought and sold.

The matter of engaging engineers has latterly taken a new phase, which puts this mercantile view in a still stronger light. It is nothing less than asking engineers to bid against each other for employment. I think I speak the voice of the Rensselaer Society of Engineers and of the best engineers generally, when I say that they will not *knowingly* enter into such competition. A doctor or a lawyer who would condescend to thus act would be justly considered as unworthy of confidence, and why not an engineer, whose position is eminently a confidential one? A large Western city recently sent letters to a number of the most prominent engineers of established reputation, and whose

works were well known, asking them to send a history of their professional experience and of their qualifications to do a certain work, saying that their names had been mentioned in connection with it as engineer. An alderman, not an engineer, was also sent to visit each man, and report. I happen to know that at least *one* veteran engineer replied, that his work had been before the public for about fifty years, and if *it* did not speak for him, *he* could not speak for himself. Is it too much to say that we owe it not only to ourselves, but to the profession, to make a strong protest against all such indignities? Has it come to this, that a well-earned reputation for honesty, thoroughness of work, and ability as an engineer, shall all pass for nothing, and that a man must furnish his autobiography every time he enters upon a new engagement? Some of the very best men are noted for their modesty, and such a rule once established would result only in advancing those whose chief acquirement is playing a solo on a well-known instrument made usually of brass.

The old times when a man who could measure a ten-acre lot was called an engineer have nearly passed away (we cannot say entirely), and we now have as engineers a body of trained men, with keen intellects, who have taken pains to fit themselves in the most thorough manner for the conduct of work. We must cultivate an *esprit de corps* by which we shall come to feel that if one suffers all suffer, by which the world shall know that we do not work merely for hire, and by which we shall make ourselves felt as fully entitled to recognition as professional men, and to be treated accordingly. Nevertheless, it is true that we must live by our profession, and unless we set a proper financial value upon our services, others will not do it for us. It is the duty of every engineer to make his charges to bear a reasonable proportion to the value and importance of the service rendered. That engineers have failed in this regard is evidenced by the fact that almost without exception our best engineers *never* acquire a competence by the legitimate practice of their profession. Like other men, they are sometimes fortunate in an outside speculation, and many abandon the profession and seek for larger returns as contractors; but this does not invalidate the fact that the professional practice of the engineer in this country is *not* remunerative. That this is not a necessity is shown by the many engineers in foreign lands who become men of wealth and influence. *There*, when a man builds a large and important work, he is knighted and made much of (the latest instance being the knighting of Sir James Brunlees on the recent completion of the tunnel under the Mersey at Liverpool); *here*, he is discharged at perhaps a month's notice, and often before he has had an opportunity of putting on those last finishing touches of which the necessity is not known by his successor, or which are utterly neglected by him. Salaries of \$250 per day, and even more for a month continuously, are not uncommon among English engineers, but such fees are unheard of here. American *architects* have gradually come to the agreement to charge five per cent. upon the total cost of a work for plans, specifications; estimates, detail drawings, and such superintendence as is needed to insure a proper rendering of the specifications; but this does not include the payment of a clerk of works, or for extra services in the matter of securing site or anything outside of the work itself, and the charge is greater on small buildings. In the matter of the Tower Bridge, in London, now under construction, the general design was made by the City Architect, but the engineering features were worked up by an engineer. The total estimated cost, as presented to Parliament, was over \$3,000,000, and, after considerable controversy, the sum of \$150,000, or five per cent. on the estimate, was voted by the Court of Common Council as the rightful payment for the service, to be divided between the architect and engineer as they might agree. This was spoken of as being the "standard commission." Now, while it may not be practicable for us to make this a standard at the present, there is no reason why it may not be a guide where there is no other. Those who have not considered the matter will be startled at the difference between this and the amounts our engineers ordinarily receive. Of course, such a standard cannot be reached in a moment, but it will never be reached if no effort is made. It is not the part of prudence to attempt reforms by violent changes, and I would be far from recommending anything like the unwise methods too often pursued, but we should all set our faces in the right direction. Let the community learn that the engineer must be an educated man; that to meet the ever-widening calls upon his skill made necessary by the great works of recent times, and the greater ones following on every advance accomplished, he must call to his aid all science, both ancient and modern; that he must know of the labors of others and use them to the best interests of his fellow-men, and that the widest scholarship is now a necessity, and, when this lesson is learned, men will begin to understand that engineering is *indeed* a profession, and worthy of all the emoluments so freely accorded to the other learned professions in the land. It is but just that since from his position as judge and arbiter on the enterprises he helps to develop, he is precluded from investing in them, he should be fully paid for professional services.

In connection with the question of a high standard of professional honor arises a practice (to be deprecated) which is sometimes indulged in, of an engineer acting as adviser and recommending in that capacity an article of which he is the patentee, or in which he is personally interested. An engineer has no right to have any other interest than that of his employer; he degrades the profession and brings discredit upon it whenever he allows himself to be placed in a position where he is actuated by divided motives. He may come forward *avowedly* as the advocate

*From an address before the Rensselaer Society of Engineers, Troy, N. Y.

of a special contrivance or method and be entirely blameless, but he may not accept service as an engineer and while acting as such so shape reports or designs as to favor his own interests. An anecdote is related of the late Mr. Alfred W. Craven, when engineer of the Croton Aqueduct, that at one time he had a water-meter brought to his notice very favorably and with the request that he take \$1,000 of the stock. He said he had no money, but the promoter said that need make no difference, he would see to that. As the man left the room, Mr. Craven said: "There is one thing I want to say before you leave, that so long as I am in the department no meter that I am interested in can ever be introduced on the work;" and it never was.

There is another indirect injury done to the profession, which is caused by the rivalry between the large firms connected with the building of bridges and other engineering operations. These furnish information and designs presumably without pay, but really the cost enters into expenses and has to be charged on the cost of the product. There is much to be said on both sides of this question. Uniformity of design certainly tends to cheapen production, but there will also be a tendency to a sameness of thought and to quenching the spirit of investigation and progress. Centralization is the inevitable sequence of the effort to furnish such work at the lowest cost, and the engineers, who are the brains of such establishments, lose their individuality and become but parts of a great machine. It is quite certain that the fairest way of treating the matter would be for a reasonable charge to be always made for designs so furnished.

I come next to a duty which by many seems never to have been even thought of. I refer to the obligation resting upon every man to make known the results of all professional practice, which have novelty or are of value for any other reason. Here the selfish spirit is too apt to rule, with the underlying idea that if technical knowledge be made public others will seize upon it, and by competition interfere with the chances of employment that would otherwise ensue upon exclusive control. It may be questioned whether even upon this low plane of self-interest one's purposes are not best served by publicity. As between a man who has made it evident both practically and by proper publication that he knows how to do a certain thing and a man who follows confessedly as a copyist, the first will assuredly be the most likely to be sought out when the same problem is presented a second time. Numerous instances could be pointed out of recent occurrence, but it is not desirable to go further in this direction; we are not concerned at the present with the financial but with the ethical question: what is our duty? A digression may here be pardoned for the purpose of pointing out the position which every professional man holds as a unit in the great mass of humanity, as a factor in our modern civilization, and as a debtor to the world of science, literature, and art—to do what he can to repay in kind that which he has so bountifully received. He cannot "live to himself alone" even if he would. Generous men everywhere have recorded facts, experiments, theories, experiences, designs, statistics, in order that he "may enter into their labors," and progress from the high vantage-ground thus ready to his hand. In view of all this can any man rightly say that he has no duty to perform in return? or that what he discovers is his own, and he will keep it to himself? I verily believe that it is lack of thought which allows the experience gained on so many important works to pass into oblivion and be lost to the world. Lack of time is the usual excuse, but lack of inclination is in many cases the real reason. Whatever it may be, let us see to it that we are not among the delinquents. I would not urge that this be done in a spirit of pride; on the contrary, when a man thinks soundly on such matters and sees how really little of his work is entirely his own, he must ever feel humbled. I would, however, that every one shall feel it to be a sacred duty to record his professional experiences in some proper way, by reports, by papers to societies, or by discussions in technical journals, for the benefit of those who shall follow him. The publishing of full reports might be made more common if we were always faithful in urging the duty upon boards of direction, and such reports are considered by engineers the most satisfactory sources for the latest professional information.

The last duty to which I propose to call your attention is a very practical one, which in several very prominent instances of late has been but imperfectly performed. I refer to the obligation always resting upon an engineer, of making all statements on which proposals are asked in lettings of work, clear and unmistakable. All specifications should be explicit, and state, as nearly as language can, just what the contractor will be called upon to do, and all information attainable as to the nature of the site, difficulties of foundation, etc., should be clearly set forth. In doing this, the engineer should remember that the contractor also has rights which should be fully cared for, and not try to get an undue advantage by any trick of language. One of the cases referred to in which this duty was imperfectly performed was in the specifications issued for the Hawkesbury bridge, now under contract to be erected near Sydney, in New South Wales, and which will be the most important structure yet undertaken in the Southern Hemisphere. Here is a bridge which is to cost over one and a half millions of dollars, and of which, in referring to the designs submitted, *London Engineering* says as follows: "A bare glance at the designs shows either the piers are unnecessarily massive in some cases, or undoubtedly too slender in others. This great want of uniformity is due, no doubt, to a limiting pressure on the foundations not being specified in the conditions, though minute instructions were given for the superstructure. It seems probable that this lack of information or of conditions regard-

ing the doubtful and most costly portion of the work, may be a reason why so few firms known as bridge builders appear to have availed themselves of the opportunity of tendering, so reducing the competition, to the disadvantage of the colony." In a large work nearer home, a somewhat similar experience has been had, if reports in the papers are to be credited. It seems almost a truism to say an engineer is unfaithful to duty, whenever he allows vagueness to enter in any form into his work, especially in so important a matter as a specification. I know that an engineer is often hurried to bring forth results, and to try sometimes to accomplish impossibilities in the matter of speed; but an energetic protest would in most cases secure the time required; and when it is made perfectly clear that uncertain borings and insufficient examination as to site, indistinctness in requirements or immature plans, will be invariably followed by an increase in amount of bids to cover the factor of ignorance, there are few boards which cannot be influenced to a right decision. An engineer is not responsible for additional cost, when too short a time is allowed for proper development of a scheme, or when plans are substantially changed after estimates are made; but he is justly held accountable for wide departures from estimates when time is given for full preparation.

I have thus brought before you some of the ways in which the best of us are at times found wanting. In the rush and turmoil of active practice, and the rapid advances the profession is making in all directions, it behooves us at times to pause and see whither we are drifting, and to adjust our lives anew to the increased responsibilities thrown upon us. We are not alone in this regard. Men of all other professions may take some portion of these lessons to heart. As men and citizens, unless we enter fully into the idea and the desire that the world may be in some measure made better and happier from our having lived in it, we have not only much to learn, but we are missing the chiefest end of our existence. We shall reach our most perfect manhood only as we do all our work under the fullest appreciation of the meaning contained in that one word—*duty*.

THE PURIFICATION OF WATER FOR DOMESTIC AND MANUFACTURING PURPOSES.*

MUCH attention has been attracted of late years to the question of water purification, by reason of the constantly increasing pollution of the sources of water-supply, but, so far as known to the writer, it is considered simply impracticable to purify the immense volume of water now used in our large cities. Knowing this to be the state of public opinion on this subject, it has seemed that a purifying apparatus of such effective character and such unlimited capabilities as is hereafter described would deserve notice on account of its special mechanical features, and be of interest. It not only accomplishes the removal of the grosser particles, but it is adapted, by a careful imitation of nature's mechanism, to effect the precipitation of the more subtle impurities, and to secure their removal, and the impregnation of the fluid with the needful gaseous elements.

The apparatus illustrated is known as the Hyatt apparatus. Plants aggregating 3,000,000 gallons per day are in use at Cohoes, N. Y., and plants varying in their capacity

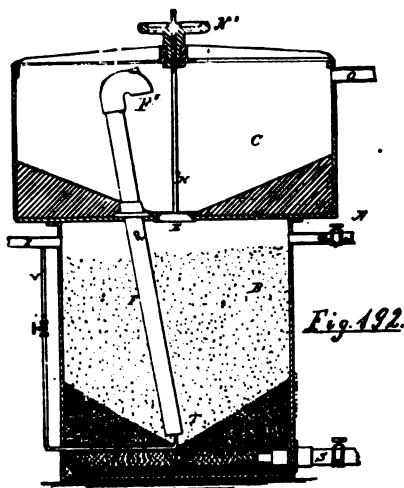


Fig. 192.

from 40,000 to 500,000 gallons daily are in use in the water-works of Raritan and Somerville, N. J., in the Arlington Hotel in Washington, D. C., and in other hotels in Cincinnati, New Orleans, Atlanta, St. Louis, Pittsburg, etc. One of 36,000 gallons is in operation at the Phoenix Distilling Company, in Chicago. As the water-supply of cities costs about \$125 per million gallons, and as the cost of operating such plants as referred to above is about \$3 per million gallons, it will be seen that the increased cost of purifying water by this apparatus is but little over two per cent.

The distinctive principle which makes the filter itself effective and of permanent efficiency, is the tumbling of the filter-bed inside out and upside down when it becomes foul, and the use of the water current to effect this, in a nearly automatic manner, so that no expenditure of force and but little skill is required to restore the filter-bed to its

* From a paper read at the thirteenth meeting of the American Society of Mechanical Engineers, by Thomas S. Crane, Newark, N. J.

normal condition. This cleansing of the bed is effected by closing the outlet from the filtering-chamber, and permitting the fluid pressure within to discharge the sand of the filter-bed through a comparatively small pipe into a tank full of water. The passage of the sand through such pipe scours the particles of the bed against each other and the inside of the pipe, and entirely rubs off the collected impurities so that the water in the receiving-tank readily washes them off and removes them by an overflow-pipe. The sand when purified by this method is left as good as new after each cleansing, and may be returned to the filter and used as at first. The operation takes from fifteen to forty minutes, according to the size of the filter, and is performed once in twelve hours, or oftener, if needful.

A large area is always supplied for the passage of the water, so that the surface of the bed performs its functions

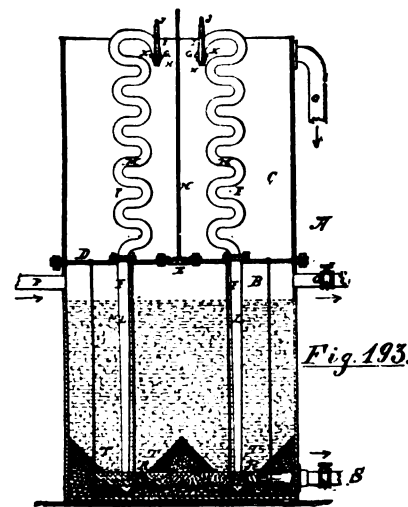


Fig. 193.

for a long time and the internal resistance involves but little loss of head or pressure, and the plant is provided with two or more filters where the current cannot be interrupted. The washing-tank may be above the filter so that the bed may be returned by gravity, or the tank and filter may be so connected with the water-pipes that the bed may be used alternately in each, and the movement after washing be thus avoided. In the illustrations the filters are shown with superposed tanks, and an automatic device for feeding coagulant is shown applied to the filter as an attachment. The aerating device is also a separate attachment, required chiefly in purifying water for drinking. Filters of this construction were used at the World's Exposition at New Orleans, and purified 1,500,000 gallons of the foul Mississippi water daily during the continuation of the Exposition, removing ten tons of solid sediment therefrom, and delivering the fluid clear and sparkling.

How this mass of sediment could be removed from the filter-bed and the latter restored to a pure and efficient

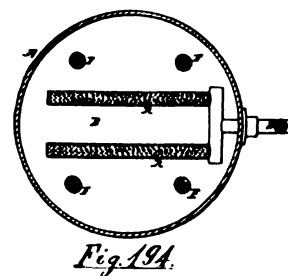


Fig. 194.

state will be understood by reference to Fig. 192, which is a mere diagram illustrating the operation of the filter.

In this figure, B is the filter, T the filter-bed, P its inlet supplied with water under a suitable pressure, R a perforated strainer-pipe placed beneath the bed to deliver the filtered water to the outlet S; C is a tank above the filter, and F the transfer-pipe extending from the bottom of the filter-bed to the upper part of the tank.

It is plain that if the outlet S be closed and the inlet P remain open, the water-pressure within the filter will force the substance of the filter-bed up through the transfer-pipe

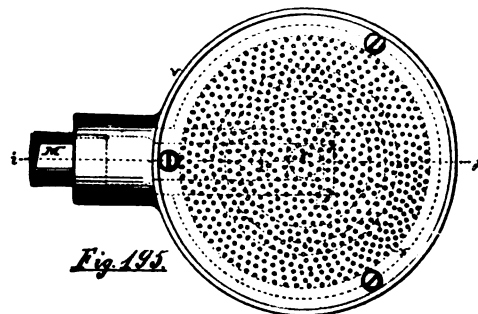


Fig. 195.

F, and deposit it in the tank. The tank is filled with water before transferring the bed thereto, and is provided with a waste-pipe O to carry off the current of foul water discharged from the bed.

The transfer of the bed is facilitated by the flow of the water through the pipe with the sand or other materials, and

the whole bed being thoroughly mingled together in the process, and its particles mixed by contact with the return-bend shown at the top of the pipe F, it is then ready for renewed use, and is restored to its place within the filter by opening a valve E, seated in the tank bottom and actuated by a screw-stem N and the hand-wheel N' above the tank.

The metal bottom of the tank may be made conical to assist in discharging the sand therefrom, or may be lined with brick-work and hydraulic cement in conical shape, as shown in the drawing.

As the filter proper remains filled with water when the bed has been transferred to the tank, the filtering material receives an additional washing as it falls into the same, the inlet-pipe being closed by a suitable cock, and a cock Q in

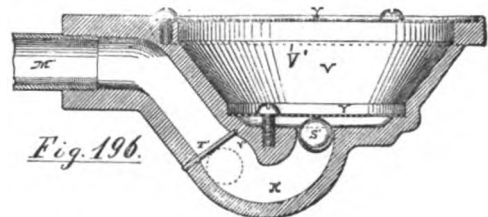


Fig. 196.

a waste-pipe at the top of the filter being opened to permit the water engaged in such washing to flow off.

Although not required in most cases, a small pipe, as at V, may be led from the inlet P to the lower end of the transfer-pipe, for introducing a jet of water directly at the bottom of the transfer-pipe to facilitate the movement of the sand upward, and a hole, W, may also be formed in the transfer pipe within the filter to admit an additional proportion of water during the transfer.

Figures 193 and 194 show a section and plan of a filter provided with four transfer-pipes, having a serpentine form to secure the most complete agitation and abrasion of the particles of the filter-bed to detach all foreign matter. A special grade of sand mixed with "breeze coke," is found to be the best material for general filtering purposes. Cone-shaped formations of cobble-stone and gravel are shown in the bottom of these filters to direct the elements of the bed toward the lower ends of the transfer pipes, but are not required when the water pressure is applied at the bottom of the bed. By operating the filter under pressure up to 40 pounds on the square inch, the volume of water passed through the filter may be very greatly increased; the tops of the transfer-pipes being then closed, to prevent escape of water, by a valve, as at H in Fig. 193.

Outlet strainers adapted for such a use are shown in Figs. 195 and 196, and are supplied with the water during the transfer by a connection with the inlet-pipe.

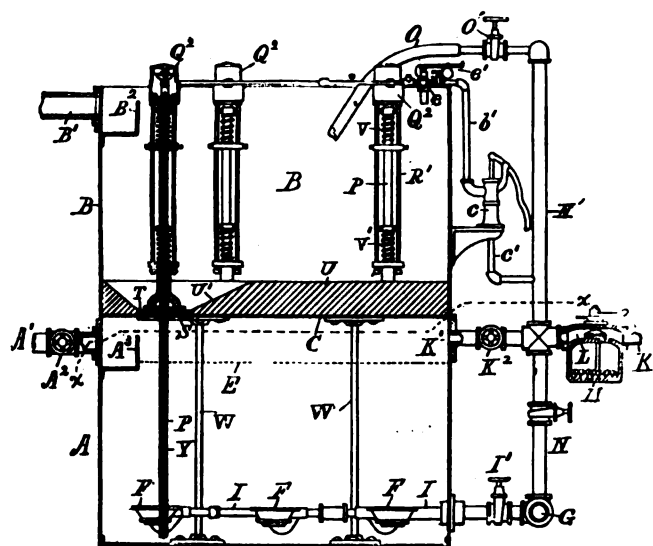


Fig. 197.

The strainers consist in funnels, having their upper and lower ends covered by screens of perforated copper; and the space between these two screens is, in practice, filled with copper shot or flakes prepared for the purpose; the object of which is to permit the use of a coarse strainer, while preventing the escape of fine filtering material. The arrangement and operation of these conical strainers are shown in Figs. 197 and 198, where a filter 10 feet diameter and 13 feet high is shown, provided with all the necessary attachments for purifying water at the rate of 250 gallons per minute, more or less, according to the foulness of the water. In these views, the filter is shown provided with four transfer pipes P, having stationary pistons attached, by brackets, to their upper ends; and hydraulic cylinders Q, fitted to such pistons for opening automatically the transfer pipes and the discharge-valves in the bottom of the tank. A plan of such cylinders and discharge-valves and their water-connections is shown in Fig. 199. In Figs. 197, 198, and 199, A is the filter, B the tank, C the bottom of the tank braced by stay-rods W, to support the flat ends of the filter against internal pressure, and F are the strainers, shown in Fig. 198, connected, in three separate series, by pipes H, I, J, to a main discharge-pipe G, provided with cock G'. As the first water filtered after

the cleansing of the bed is not clear, it is discharged into tank for the subsequent washing. K is the inlet-pipe connected by cock K' to the top of the filter for such purpose; and by a cock and pipe N to the pipe G, by which means the inlet current can be diverted into any of the pipes H, I, or J, to wash the filter-bed in sections by pressure from beneath. S are conical rubber valves to discharge the bed from the tank after the washing operation, and O is a hose supplied with water by a cock O', for the purpose of washing the sand from the seats of the valves S before closing the same.

When operating the valves, the water is introduced between the piston and the upper head of the movable cylinder; each piston is supplied with water by a pipe a', and

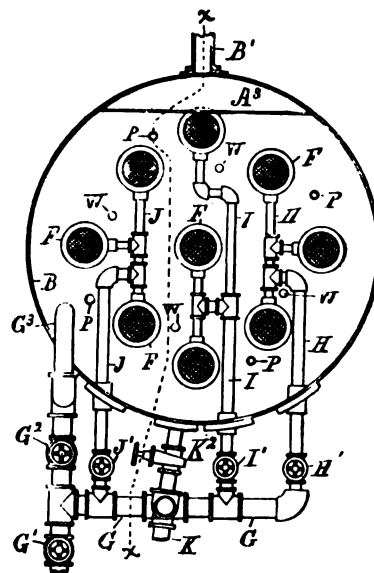


Fig. 198.

a header b, having a safety-valve c thereon, is provided with water by pipes b' and c' leading through a hand-pump c.

The hydraulic cylinders, by a partial movement, lift the caps which close the tops of the transfer-pipes, and hold them open during the transfer of the filter-bed to the tank; while a further movement of the cylinders operates to raise the valves S' and to permit the return of the cleansed material to the filter.

The object of the pump c is to produce an increased pressure in the cylinders where the inlet-pipe will not furnish sufficient force to raise the valve S when required. A guard B' is extended across one side of the tank in front of the waste-pipe B', by which the impurities are carried from the filter-bed when it is discharged into the tank; and a guard A' and waste-pipe A' are similarly provided near the top of the filter to discharge the impure water therefrom when the cleansed filter-bed is restored to the

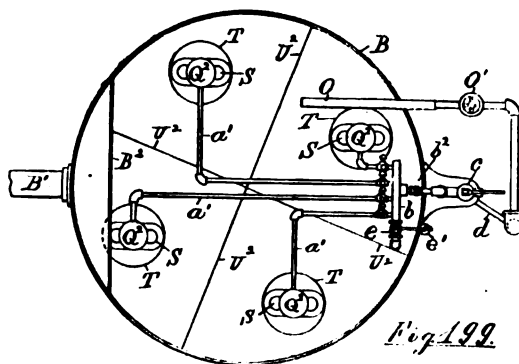


Fig. 199.

filter. The connection of the strainers F with the pipe G in groups, is shown in Fig. 198, to illustrate a means for washing the filter-bed in sections where there is not head-room sufficient to admit a superposed tank. In such case no transfer-pipes would be used, but the bed would be cleansed within the filter and the impurities discharged with a current of water from the waste-pipe A'.

By closing the inlet-cock K' and opening the waste-cock A', and one of the cocks leading to the strainers, as H', the strainers connected with the pipe H would receive water under pressure and discharge it upward through the filter-bed, loosening and agitating one section of the same and discharging the impurities deposited upon its upper surface (represented in Fig. 197 by the dotted line E). When such section of the bed was cleansed, the water would be cut off from such strainers, and the other sections of the bed be successively cleansed in a similar manner. Finally, the water would be admitted to all the strainers at once to rinse out the bed, and to level its upper surface before using again. The cocks would then be arranged for the filtration to proceed downward through the bed and out by the strainers as before.

The coagulant material, in a liquid form, is sometimes supplied to the impure water by means of pumps which required some motive power, but the device shown in Fig. 200 and connected to the inlet-pipe K in Fig. 197, is entirely automatic in its operation.

M is the receptacle for the coagulant, K a passage formed above the top of the same for the entire current of water passing to the filter, and r and s are two openings formed in a valve-seat at the middle of the passage and leading

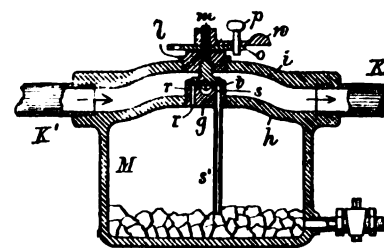


Fig. 200.

downward into the receptacle, a pipe s' being projected from one of the openings nearly to the bottom of the receptacle.

The valve-disk t not only controls the admission of water to the holes, but serves, as well as the valve-seat, to form a slight obstruction in the passage K, and thereby varies the water-pressure above the openings r and s,

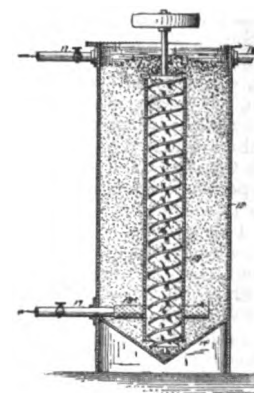


Fig. 201.

which are arranged in a line with said passage. A circulation is thus induced through the opening r into the receptacle; the liquid forced from the receptacle into the passage K being impregnated with the coagulating substance, and the proportion of fluid circulating through the receptacle being regulated by adjusting the valve-disk t. The disk can be held in a regulated position by a pin p inserted through a lever n into an index-plate o, and the delivery of a coagulant for each setting of the disk having been determined, the proportion of the coagulant delivered per thousand gallons is thus regulated.

Professor Austen, of Rutgers College, states that less than one grain of aluminic sulphate per gallon will act as a participant to the organic matter in drinking-water, and will coagulate the suspended inorganic matter so as to

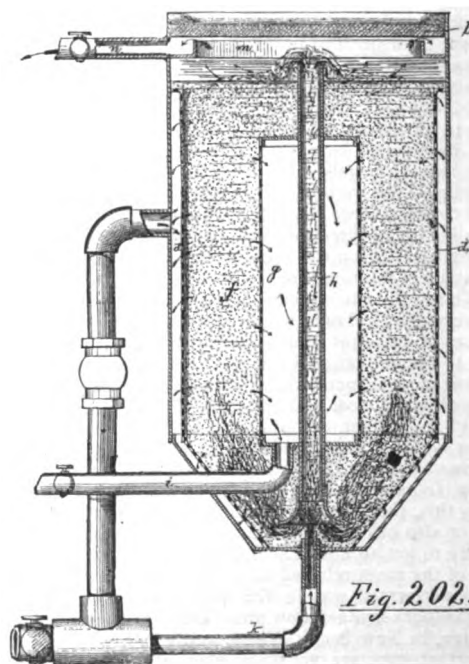
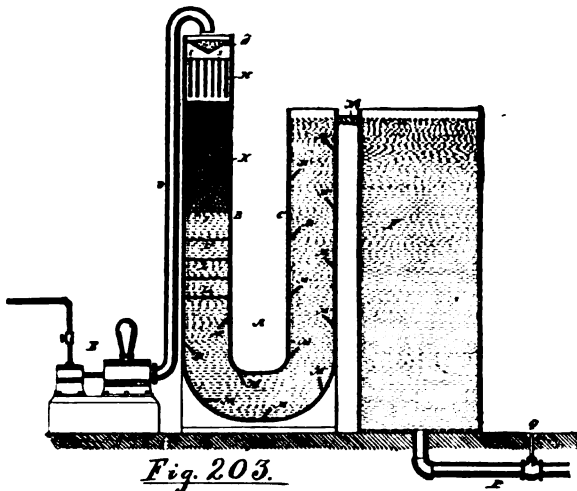


Fig. 202.

make them removable by filtration. A much greater amount can be used without any appreciable trace of the alumina remaining in the water. It is entirely combined with the precipitate and removed by filtration.

Alum may therefore be conveniently applied by this means, and may be safely used for drinking-water; lime may be applied to remove hardness for washing purposes, and soda for rendering sulphate of lime harmless, in water for steam-boilers. Where the current of fluid passing to

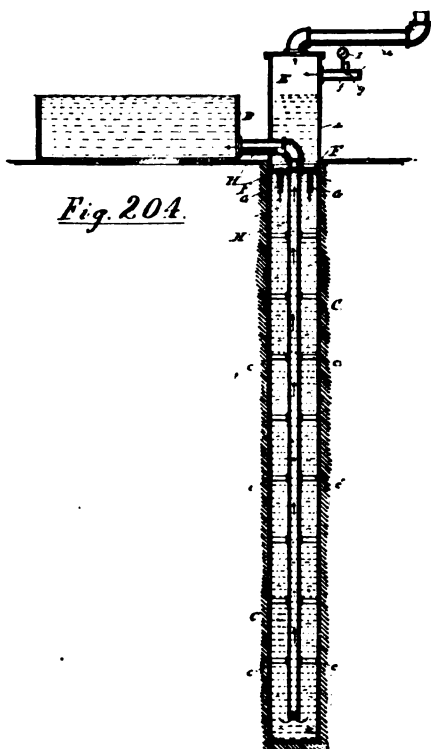
the filter is not supplied with sufficient pressure to transfer or cleanse the bed by any of the methods already shown, a mechanical means may be used as a screw conveyor arranged vertically within a tube in the centre of the filter, as in Fig. 201; the filter in such case being adapted for continuous cleansings and filtration at the same time. Where sufficient pressure is employed, such continuous cleansing may be effected by the means shown in Fig. 202, where the water is admitted by an inlet *e* to a perforated casing *d* at the periphery of the filter and discharged through a perforated cylinder *g* in the middle of the bed into an outlet-pipe *i*. A transfer-pipe *h*, provided with an inverted funnel at its lower end, is passed up through the cylinder *g*, and a jet of water from the inlet-pipe is directed from the bottom of the filter into said funnel. A check-valve is inserted in the pipe *e* and slightly loaded to produce an ex-



cess of pressure in the jet-pipe *K*, and thus enables the jet to penetrate the filter and gradually move the substance of the filter-bed up through the transfer-pipe and discharge it upon the top of the bed, where the water accumulated from the jet is discharged into an annular trough *m* with the impurities, and passed out by the waste-pipe *n*.

The means for mingling air with the water is constructed essentially upon the principle of the Sprengel pump, by which the contracting vein of a descending current of water forms a sufficient vacuum to draw in the air and carry it along with the current.

The air thus entrapped combines more permanently with the water, by the subsequent application of pressure thereto; and the devices shown in Figs. 203 and 204 are adapted to subject the mixture to such pressure by a column of water without material loss of head, and thus to secure the effective aeration of the largest volumes of water without the consumption of any power.



In both constructions, two vertical conduits are employed for an ascending and descending column of water, the water passing from one to the other at the lower end and rising upward in the ascending pipe, from the top of which it can be drawn fully aerated for consumption. In Fig. 203 the water is represented as aerated during the process of pumping it up into a reservoir. *D* is a pipe leading the water to the top of the descending column *B*, where it falls upon a screen *G*, and thence into cups *I* upon the tops of tubes *H*, acting as Sprengel pumps, which draw air through the tubes with the water, and discharge

it into a bed of gravel *K* resting upon a grating *J*. This gravel, with screens *L*, *I*, and reflectors *N* arranged at different points in the conduits *B* and *C*, serve to intermingle and combine the air with the water, which is then discharged into a reservoir *F*, from which it supplies the distributing main *P* under the necessary head. Supposing the water to be already in some elevated site, to secure the necessary pressure in the distribution pipes, the aerating apparatus may be sunk in the ground, and the water may be led from such site into the descending conduit through a chamber in which the air is mingled with the water by the falling current, as in Fig. 204. In this construction the ascending conduit *H* is placed inside the other, and the Sprengel pumps *G* are fixed below the air chamber *E*, through which the water falls. The air enters at *g*, through an air-pipe *f*, and a meter is shown attached at *I* to register the volume of air actually admitted. The water, when aerated, rises nearly to its original head, so that but little power is consumed in effecting the aeration. A velocity of four feet per second in the pipes is found sufficient to carry the air downward, and the pressure to which it may be subjected has obviously no limit except the depth of the mixing conduits.

THE FIFTH ANNUAL MEETING OF THE NEW ENGLAND WATER-WORKS ASSOCIATION.

THE New England Water-Works Association held its fifth annual meeting at New Bedford, Mass., June 16, 17, and 18. The meeting assembled at Odd Fellows' Hall on Wednesday afternoon, about fifty members being present, and were welcomed by His Honor, Morgan Rotch, Mayor of the city. The address of welcome was briefly responded to by President Coggeshall. The following gentlemen were then elected members:

Active.—William E. Nason, superintendent, Franklin, Mass.; William Ripley Nichols, professor chemistry, Boston, Mass.; W. S. Chaplin, professor engineering, Harvard University; W. H. Whitcomb, president water company, Norway, Me.; Martin Coryell, engineer and superintendent, Lambertville, N. J.; Charles B. Brush, engineer and superintendent, Hoboken, N. J.; Edward H. Phipps, hydraulic engineer and superintendent, New Haven; Robert L. Cochran, superintendent, Nahant; Charles H. Nettleton, agent and superintendent, Birmingham, Conn.; George P. Westcott, treasurer water company, Portland, Me.; A. S. Frierson, superintendent and engineer, Columbus, Miss.; Patrick Kiernan, superintendent, Fall River; Francis A. Dewson, commissioner, Newton; Harry C. Heermans, superintendent, Corning, N. Y.; Nathan C. Bickford, superintendent water-works, O. C. R. R., Boston; James P. Wigal, superintendent, Henderson, Ky.; V. C. Hastings, superintendent, Concord, N. H.; John M. Diven, secretary and treasurer, Elmira, N. Y.; James Wilson, engineer, Kingston, Can.; Edward Heywood Brown, secretary, treasurer, superintendent, Syracuse, N. Y.; William Ryle, superintendent, Pater-son, N. J.; A. W. Denman, secretary and manager, Des Moines, Iowa; M. L. Holman, assistant engineer, St. Louis, Mo.; Stephen E. Babcock, chief engineer, Little Falls, N. Y.; Frank L. Fuller, engineer, Wellesley Hills, Mass.; David B. Kempton, commissioner, New Bedford; Joseph E. Beals, clerk and registrar, Middleboro; Charles F. Allen, treasurer, Hyde Park; Walter Coburn, president, Lowell; William Dixon, superintendent, Mt. Pleasant, Mich.; W. P. Whittemore, superintendent, North Attleboro.

Associate.—W. C. McClennan, contractor, Boston; Z. E. Coffin, manufacturer supplies, Neponset, Mass.; J. A. Tilden, Hersey Meter Company, Hyde Park, Mass.

The president then delivered his annual address, of which the following is a synopsis: The society was the result of a meeting held in April, 1882, when twenty-one gentlemen, all managers of water-works, met in Boston for that purpose. The association was fairly launched June 21, 1882, with twenty-seven active members. At the end of the first year this had increased to forty-three, and at the Lowell meeting, at the end of the second year, there were fifty-seven members. During the third year four meetings were held instead of two, and at the Springfield convention one hundred and twenty-four members were reported. During the last year five meetings were held, and the membership now represents about forty per cent. of the total number of water departments and companies in New England. The informal gatherings on Saturday have resulted in great good to all who have taken part in them, by enabling them to learn the methods of others. He then called attention to the report of the committee on revision of the constitution, as follows:

"In the report as presented there is one portion to which I would call your attention especially—viz., Article V., Section 1, and Article VI., Section 4, which provide

for the appointment of a Board of Editors, who shall prepare for publication the transactions of this association. Two reasons present themselves for the appointment of such board: First, the including of so much of the detail of the discussions necessarily compels the issue of a bulky pamphlet which in itself is expensive; second, in the discussion which follows the reading of a paper, many casual statements are apt to be made without much thought on the part of the speakers; perhaps some simple question asked, some trifling occurrence mentioned, all very well and highly appropriate at the time the words were spoken, but which the speaker would not care to have set down as an expression of his deliberate thought."

He next made the suggestion that at some of the informal meetings each member give an account of some mistake or mishap in his practice, on the ground that more is to be learned by the candid avowal of such than by the description of pronounced successes. Discussions were next remarked upon:

"We all agree that the discussions that follow the reading of a paper should be made the most profitable part of the exercises of a society such as ours. I would call your attention to a method already adopted by some organizations. In this method a complete abstract of the subject matter in each paper is drawn off and sent to each member at least a month previous to the convention. This provides those who desire it with the line of thought which the paper contains, and the member is thus enabled to prepare himself to take part in the discussion previous to its occurrence. If he is so inclined he can then present his discussion in writing."

The suggestion was made that two months before a convention would not be too long a time for the paper to be in the hands of the Secretary.

The speaker next commended to all members a more extended use of the graphical method of giving results, such as pumping-engine duty and other statistics, and then remarked as follows:

"I wish to add a few words at this time relative to a topic which was considered by you at the last annual convention. I refer to the paper prepared and presented by Mr. Billings and myself on 'Uniformity in the preparation of the annual report.' At the time it was presented this scheme seemed to meet with your hearty endorsement and recommendation, yet, of the reports issued the past year, the plan has been adopted and carried into effect in the following places only: Burlington, Vt., Woonsocket and Pawtucket, R. I., and Springfield, Newton, Worcester, Holyoke, Taunton, New Bedford, Mass., New London, Conn., and New Orleans, La. In some of these places the scheme was most carefully followed; in others the attempt will be found far from satisfactory to those who may wish to compare results in two or more places. I trust the reason so few adopted this plan may be explained by the delay which occurred in the delivery of the transactions in which the instructions and descriptions of the plan were included."

The passage of a law requiring statistical information from water companies was recommended. The importance of condensed summaries was next spoken of:

"In examining the list of summaries which have appeared in the reports of various departments for the past year as before stated, I find none more complete and in full accord with the plan than those from Burlington, Vt., and Woonsocket, R. I. Mr. Parker and Mr. Kent have both given fine examples of what may be easily accomplished by each of us. They apparently have not experienced any particular difficulty in arriving at the desired results, and why should any of us? That it will require extra labor to obtain these facts there is no doubt, but of course each of us expects to do his share. I hope you will not consider me over zealous in this matter, but I wish each member would agree, if it is in the range of possibility, to see to it that this 'summary' appears in the very next report which is issued by the department under his charge. Will you not give this your earnest consideration, and all agree to give it a fair trial the coming year, so that, at our next meeting, it will be possible to place before you the comparative statistics of the many departments represented here to-day? In no other way can we ascertain the merits or defects which the plan may possess."

The question of selection and assignment of topics for discussion by the Board of Editors and of the value of meetings for discussions, in lifting all out of the ruts of isolated practice, closed a very practical and useful address.

After discussion, the constitution was amended in the following points: To provide for the election of a Board of Editors, the President and Secretary to be members of same; To provide for quarterly meetings on the second Wednesdays in March, June, September, and December—the June meeting to be the annual meeting. The officers must be residents of New England, and regular meetings must be held within its borders, but active members may be elected from other localities.

William B. Sherman, of Providence, of Committee on Cast-Iron Pipe, presented a preliminary report requesting power to ask in the name of the association for information on the following points, and for extension of time, which were granted:

- (1) Cast-iron, its nature and varieties.
- (2) Methods of manufacture in use at pipe-foundries.
- (3) Theoretical strength of pipes.
- (4) Actual strength as shown by tests.
- (5) Comparison of No. 3 and No. 4.
- (6) Reasons for difference.
- (7) How near any one of the theoretical formulæ can we go.
- (8) What pressure is produced by water-rain.
- (9) Combine No. 7 and No. 8, and determine factor of safety.
- (10) How many classes of pipe should there be as regards weight and depth of socket.
- (11) Table of weights and sizes deduced from foregoing.

The Committee on Uniform Classification of Water Rates reported 1,100 circulars sent out and 700 replies received, and asked time for preparation of report.

Wednesday evening the Committee on Exchange of Sketches and Blue Prints reported, showing the value of information which may thus be obtained.

A paper by George A. Ellis, C. E., upon the "Determination of the Discharge of Mains by the Pressure-Gauge," was read by the secretary.

There was substantial agreement after a discussion of the subject of licensing plumbers, that in some way water departments should be able to control the work of plumbers.

The next subject, "What is a proper and equitable charge for hydrant service," brought out a general expression that all taxpayers should contribute toward the support of the water department, aside from his water-rents, since fire-protection required that the works be nearly triple the size that would otherwise be required. Mr. Howland suggested three sources of income: First, water-rents; second, a charge to the city for hydrants; third, a special tax item which should vary yearly according to the financial condition of the department.

On the question whether water can be refused and the applicant still be held liable to a water tax, Mr. Cate, of Newton, Mass., thought the law would compel a city to extend a water-main to any citizen whatever the cost, where the taker would comply with reasonable requirements, paying say five per cent. on the outlay. Mr. Billings, of Taunton, Mass., said his city was extending a main two miles through a thinly settled territory on just this ground; and Messrs. Darling, Holden, Howland, and Coggeshall thought the principle sound.

Thursday morning the following list of officers was chosen by the convention: President, Henry W. Rogers, superintendent, Lawrence; Vice-Presidents, J. C. Broatch, superintendent, Middletown, Mass.; F. H. Parker, superintendent, Burlington, Vt.; Benjamin S. Babcock, superintendent, Nashua, N. H.; George P. Wescott, superintendent, Portland, Me.; Thomas Lovell, superintendent, Fitchburg, Mass.; Willard Kent, superintendent, Woonsocket, R. I.; Secretary, Albert S. Glover, registrar, Newton, Mass.; Senior Editor, Robert C. P. Coggeshall, superintendent, New Bedford; Junior Editor, William R. Billings, superintendent, Taunton, Mass.; Executive Committee, George A. Ellis, hydraulic engineer, Springfield, Mass.; Walter H. Richards, superintendent, New London, Conn.; Frank E. Hall, superintendent, Quincy, Mass.; Finance Committee, George E. Batchelder, registrar, Worcester, Mass.; Nathaniel I. Jordan, treasurer, Auburn, Me.; Walter H. Harding, registrar, Cambridge, Mass.

A paper by Colonel J. T. Fanning, upon the "Best Type of Water-Power Pumping Machinery," was read by the secretary, in which, after a review of existing models, he reached the conclusion that in the present state of mechanics the turbine wheel and double-acting plunger pump is undoubtedly the best combination for direct pumping in localities where reliable water-power can be obtained.

The next paper was by Desmond Fitzgerald, of Boston, upon "Rainfall, the Amount Available for Water-Supply."

The amount of water collected may vary from 25 to 60 per cent. of the total rainfall, and 42 per cent. is the mean.

To be safe, the *minimum*, and not the *average*, rainfall upon a water-shed should be used as a basis for calculations. The action of forests in preventing the freezing of the earth's surface and thus allowing percolation to go on in winter, as well as in summer, was noted. The discussion was participated in by Messrs. Richards, Sherman, Stacy, Tidd, Billings, and Phineas Ball, of Worcester. The latter gentleman referred to experiments which he made in 1863 for the city of Worcester, which showed 48 per cent. of the rainfall flowing over a weir constructed across the stream, draining the water-shed under consideration. Both Mr. Fitzgerald and Mr. Ball laid stress on the point, that from February to June, or even from April to June, was the best part of the year for storing water. Evaporation and absorption go on rapidly after the middle of June, and a small proportion of the rainfall reaches the streams after that time.

Mr. Walker's invitation to hold the next annual meeting at Manchester, N. H., was accepted with thanks.

Mr. George H. Frost, of *Engineering News*, was elected an honorary member, and was introduced to the convention by Mr. Darling.

The next paper was by Dexter Brackett, Assistant City Engineer of Boston, upon water-waste.

The paper called attention to the fact that from 33 to 50 per cent. of the water supplied in the larger cities was not used, but wasted; but it is easier to obtain a *large* appropriation to increase the supply than to obtain a *small* one for restricting waste.

The methods used in Boston for detecting waste and the results obtained were then described.

A paper on water-meters, by L. A. Taylor, C. E., of Boston, was next read by the secretary, giving the result of some experiments with house meters at his home. He believed that meters should be applied with discretion so that the waste may be stopped without affecting the revenue. Inspection should go hand in hand with the meter system.

These two papers were followed by an animated discussion.

William Rotch, of Boston, said that the supply of water is limited. Cities are so close together and growing so fast that they will soon be fighting for the possible supplies. The meter is the best inspector and the cost of its maintenance has been exaggerated. The favorable showing made by Fall River and Providence testify to the value of meters. The poorest meter is better than any other check.

Mr. Brackett thought the depreciation of meters so rapid that their universal application would not pay. Mr. Stacey thought the value of meters to any water department depended on whether the water was obtained cheaply by gravity or in some expensive method by pumping.

Hiram Nevons, of Cambridge, appeared as an advocate for house-to-house inspection with as few meters as possible, and Mr. Hawes thought that while Mr. Nevons's system of inspection might work well in a city like Cambridge it would never do in a manufacturing city like Fall River. Mr. Chase thought a weekly inspection would overcome the waste, but that this would be a nuisance to which takers would not submit. He favored the universal use of meters, and incidentally remarked that he knew of no article which is sold so loosely as water.

The evening session was devoted to a discussion of various topics, among which may be noted: Cup and wiped joints, water-hammer, the filling of large mains, and driven wells. The discussion was very general and was continued until a late hour. At the close the new president, Mr. Rogers, was installed in office, and briefly expressed his thanks, and, on motion of Ex-President Coggeshall, the convention adjourned to the second Wednesday in September.

Friday morning was devoted to a ride about the city, visiting the reservoir, pumping-station, etc., and the afternoon to a trip on the bay.

Gas and Electricity.

Illuminating Power of Gas in New York City.

Week ending	New York Gas-Light Company.	Manhattan Gas-Light Company.	Metropolitan Gas-Light Company.	Mutual Gas-Light Company.	Municipal Gas-Light Company.	Krickerbocker Gas-Light Company.	Equitable Gas-Light Company.
June 19....	25.50	20.32	22.10	30.10	29.81	23.00	32.31

E. G. LOVE, Ph.D., *Gas Examiner.*

THE Committee on Manufactures of the Massachusetts Legislature has reported a bill relating to gas companies, which requires every company to have an office in the city

or town where its works are located, where shall be kept all the books and papers which the law requires to be kept in the State, also such books as show its receipts and expenditures and its indebtedness and financial condition. All these must be open to the inspection of the Gas Commissioners. Records must be kept in prescribed form, after the manner of the railroad reports. The issue of bonds is put under strict regulations. No sale or franchise or lease of gas-works is permitted, except to a company occupying adjoining territory, or one whose mains can be connected or which occupies the same territory, and then under terms approved by the Gas Commissioners. But no lease shall be valid unless approved by three-fifths in interest of the stockholders of both companies at a special meeting called for the purpose. Any two or more gas companies in the same or adjoining cities or towns may consolidate with all the rights and duties of the several companies, and the stock shall not exceed the aggregate value of the consolidating companies, nor the total value of the property at the time of consolidation, the par value of the stock to be \$100 per share. Any name may be assumed to indicate that it is a gas company not in use by an existing company. The Gas Commissioners are authorized to order gas companies to furnish gas to applicants. After December 31, 1886, all meters must register in cubic feet, so that the quantity consumed can be easily ascertained by the consumer. No meter rent can be charged where the gas used amounts to \$7 a year.

THE commissioners of New Lots have made a contract with the Union Gas-Light Company of that town, to supply the town with over 800 lamps for seven years. The present rate is fixed at \$25 a lamp. When the town consumes gas privately to the extent of 300,000 cubic feet at the rate of \$2.50 per 1,000, the price of each lamp will be reduced to \$22.50; when it reaches 350,000 cubic feet, \$20; 500,000 cubic feet, \$18. When the private consumption is 300,000 cubic feet a day the cost will be reduced to \$2.25, and when it is 500,000 feet a day, to \$2 per thousand.

CHICAGO seems to be at the opening of an unusually energetic gas war, caused by the proposal of the South Side Gas Company to lay mains and supply gas in the West Side Gas Company's territory. To check this, the West Side Gas Company has given notice to the aggressor of the commencement of a suit for \$1,500,000 damages, and also threatens to carry its mains into the South Side. Meanwhile the recently defunct Consumers' Gas Company is being resurrected to operate on the South Side, and the new Equitable is also preparing to begin operations there. The immediate result will be, it is said by gas men, a drop to 75 cents a thousand feet, followed by lower prices, ending in a general consolidation of the warring companies.

Correspondence.

INSULATORS FOR LIGHTNING-RODS.

CHARLESTON, S. C., June 2, 1886.

SIR: Will you please have the kindness to give me your opinion on the following subject: I am about having a lightning-rod put up on my building. Opinion seems to be divided on the question of insulation, some recommending glass insulators, so that the rod will be perfectly insulated from the building, while others condemn the glass insulators as being dangerous, and that the glass ceases to be a non-conductor as soon as it gets wet. Will you please let me know, through THE SANITARY ENGINEER, which appears the *best* protection—a rod put up with or without glass insulators? Yours, etc., A. B. C.

[Do not use glass or other material to insulate conductors. Insulation is unnecessary and often dangerous. The rod should be attached to the building by metal fastenings, preferably of the same metal as the rod itself. Where a different metal is used, galvanic action will take place, with the deterioration of the rod or fastening.]

CORRECTION OF ADDRESS.

ELMIRA, N. Y., June 16, 1886.

SIR: Saw in your issue of May 6, 1886, notice of a catalogue, etc., of Messrs. William Baragwanath & Son, Hartford, Conn. Wrote them on the subject the 14th ult. Letter returned to day.

Mention this, thinking possibly there is some mistake in address, and that correction of same may be of advantage to others wishing to correspond with them; also, to the Messrs. Baragwanath. Yours truly,

J. M. DIVEN,
Secretary Elmira Water Works Company.

[The correct address is William Baragwanath & Son, 48 West Division Street, Chicago, Ill., and not Hartford, Conn., as was erroneously printed.]

RISK OF FIRE FROM HOT-WATER AND STEAM PIPES.

MONTREAL, June 12, 1886.

SIR: Inclosed find quotations from a letter of Mr. C. Boilloirge, City Engineer of Quebec, referring to the question constantly coming up in the papers—i. e., the dangers from fire caused by contact of steam and hot-water heating-pipes with wood-work. He says:

"I am of opinion, from practical experience, that hot-water pipes in contact with wood-work are dangerous, and I only wonder that insurance companies do not refuse to insure where the necessary precautions are not taken to isolate pipes sufficiently to prevent danger, which, as I shall presently show, it is so easy to do. During soft weather, steam and hot-water pipes become very hot from the surrounding air being too warm to relieve them of or abstract their heat, as colder air does. On one occasion this winter, a very soft day, my steam-boiler had raised the temperature throughout all the pipes about the house to such a scorching heat that everywhere the wood-work was very hot, and I could not bear my hand on any portion of it without burning it, as if I held it on a hot stove. It is only two or three weeks ago that a towel laid across the coil in a room on the third floor of the house was actually scorched, as if by a red-hot iron, and this has happened more than once." He also says:

"Water heated under atmospheric pressure only attains to a heat of 212° Fah., or 100° C.; but in a five-story house, with even an open cistern in the garret above—a height, say, of fifty feet equal to a pressure per square inch of nearly twenty-two pounds—the water, of course, reaches a much higher temperature, as it does in any closed vessel, and becomes exceedingly dangerous." He goes on to say:

"Partly on that account, and to prevent the motion due to continual expansion and contraction from breaking the plastering, as it always does through walls, partitions, and ceilings when the undermentioned precaution is not taken, I specify that the holes for the steam or hot-water pipes are to be bored so much larger than the pipe (a quarter of an inch is sufficient) as to allow of inserting a sheet-iron or, better still, a tin tube, leaving a space of say one-eighth of an inch all around the pipe, with two or three little tacks or stone or iron wedges between them to keep the hot pipe from contact with the outer metallic ring. Bright, clean tin is the best thing that can be used, as, when not in contact, it never heats. So true is this that, when used as a screen around a red-hot coal-stove, though not an inch therefrom, it reflects back all the rays of heat thrown upon it; you can touch it with impunity, and it actually feels not even warm, but comparatively cold or cool."

Has not this question been settled by actual experiments, made some years ago by Mr. Stahl, of the Stevens Institute of Technology, at the request of Prof. Thurston, for the *Scientific American*, and published for that paper? If not, is the question not one of sufficient importance to warrant some of our practical scientists in taking it up, and setting the matter at rest? Yours, J. W. HUGHES.

[We referred the above letter to "Thermus," who writes as follows:

"We believe that fire insurance companies, in ordinary risks, do not pay much attention to the question of how steam-pipes are run. They examine boiler-flues and chimneys, and make a general survey of the premises, but do not insist on examining pipes under floors, as it would involve a considerable expense and damage to floors, etc., and inconvenience to occupants. This, presumably, is one of the chances they must take, and in the case of buildings some time in use, it is not great, as the conditions favoring fire from comparatively low temperatures are assumed not to be present. The Board of Fire Underwriters of New York, however, say in their regulations: 'No steam-pipe shall be placed within two inches of any timber or wood-work, unless the timber or wood-work is protected by a metal shield, then the distance shall not be less than one inch.'

"We can understand how in warm weather a hot-water pipe may become warmer than in very cold weather, as the heat of the water in the pipes (within certain limits) will depend on the state of the fire under the boiler and the condition of the atmosphere to cool the water in the pipes, but we cannot see how steam-pipes in a heating apparatus will become any hotter in warm weather than they will in cold, for the reason that the heat of steam depends on its pressure only, and it is assumed by us—as it should be in a properly regulated and safe heating apparatus—that the regulating doors and dampers keep the steam within fixed limits (low pressure). If the steam-pipes of a house can be cooled appreciably by the contact of the air of the house, the pipes are too small to carry the steam out of the boiler, when the pressure in the pipe will drop down, and consequently the temperature decrease. But then the apparatus will not work properly, and the pipes will fill with water for the want of pressure to keep the water down within the return-pipes, assuming all the time that the boiler is making steam enough for the house. If it does not make steam

enough, of course all cools, and there is no heat. But, in any case, the temperature cannot go higher than that due to the pressure, unless the steam is superheated. Superheating would account for the towel scorching, but superheating cannot follow with a properly arranged boiler that is kept full of water. With coil boilers it might, if the pressure were allowed to advance until the comparatively small quantity of water they usually contain were all, or nearly all, 'up in the pipes' in the form of steam; but this will only occur in an improperly arranged heating apparatus, and will soon be manifest by the burning out of the boiler.

"When a flat-iron off the stove becomes too cool to iron properly with, it is hotter than steam at fifty pounds pressure, and still it will not scorch a towel; whereas, an iron of the same temperature as steam at 400 pounds pressure

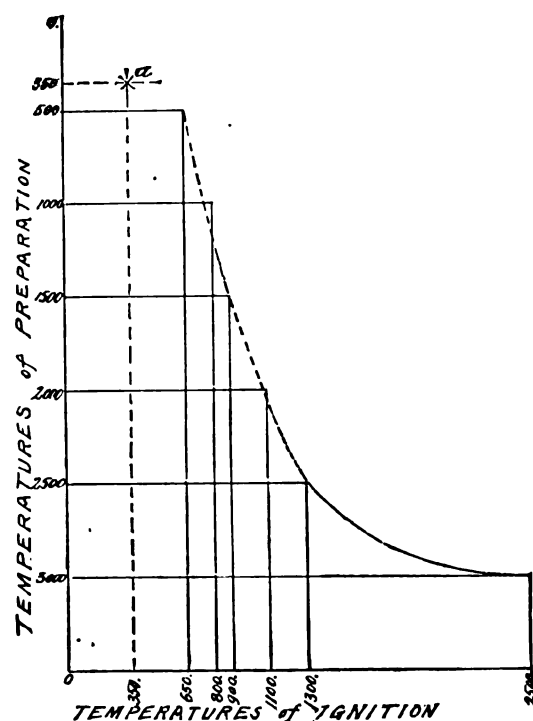


FIG. 1.

(maximum density) is just about right to iron cotton cloth with. Presumably, the steam was superheated when it scorched the towel in one day's exposure.

"Mr. Boilloirge says very truly that temperatures above that due to atmosphere can be obtained in a hot-water heating-apparatus with an open tank, but the greatest possible heat that can be obtained with a 50-foot head plus atmosphere will be 262° Fah., or that due to twenty-two pounds of steam, comparatively low temperature after all for heating-apparatus, excepting exhaust-steam or private-house work.

"The question as to whether steam at low or ordinary pressures will ignite wood or cotton cloth is certainly still an open question from the scientific point of view. There is plenty of evidence, however, that many fires have been traced to steam-pipes on the one side, and, also, much evidence that will go to prove that ordinary temperature of steam-pipes will not ignite woody fibre, the strongest being that when one starts out to do so he never can. However, Mr. Edward Atkinson, President of the Boston Manufacturers' Mutual Fire Insurance Company, and his inspectors, who have given this subject much consideration in the mills of New England, and who certainly strive to come at the truth so far as it relates to practical results, think there is danger, and claim that they have seen wood charred from the heat of hot water in an open kettle. As to whether it was charring or rotting, or discoloration, there may be some question, and as to whether it would burst into flame at comparatively low temperature there is further cause of question, but certainly any heat that will ignite a match in the presence of combustibles is dangerous, and, therefore, all ordinary precautions, especially as they cost so little, should be taken to keep wood-work from the pipes, and to prevent matches or other inflammable substances from dropping on the pipes through cracks in the floors or elsewhere.

"We know of a case where tampico (grass from which brushes are sometimes made) took fire in a drying-room (sixty-pound steam), but the evidence apparently so obtained was vitiated by the fact (as evidence) that greasy bristles were also found mixed with the fine tampico below

the coil, the latter being dried in the same room and falling and mixing with it. The grease here probably furnishes the solution, but all this still goes to prove the necessity for caution. Another case was where a steam service-pipe (eighty-pound steam) to a New York building set fire (apparently) to the sawdust and box surrounding it. In the same box was a leaky valve. Of course, there might have been a match in the sawdust, and this or some cause like spontaneous combustion from a rapid chemical reaction is all that there is to throw doubt on the evidence of fire from steam.

"We do not think tin one-eighth of an inch from a steam-pipe, with iron wedges between, a sufficient safeguard. Bright tin is good as a reflector of radiant heat, but where there is a direct metal contact in a close space it will become almost as hot as the pipe, and will then be almost as dangerous if it touches the wood. Mr. Sims, of the New York Board of Underwriters, advises a space of one inch between pipe and wood-work, and insists on having iron straps, as shown in Fig. 2, used to prevent the pipe, by any possible means, being pushed against the wood. This prevents the pipe from being lifted against the floor. He also likes to have the wood tinned closely in the cut of the joist, and insists on it when full one inch distance cannot be obtained.

"The scientific view of the question of the ignition of wood charcoal is, we believe, that the temperature of ignition bears some close relation to the temperature at which the

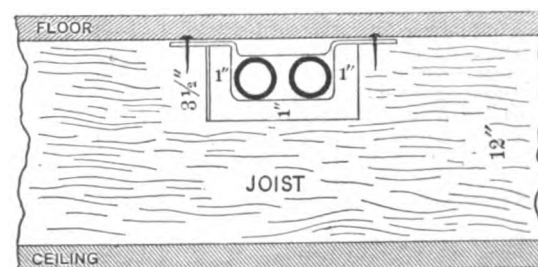


FIG. 2.

charcoal has been prepared. We therefore give Mr. Stahl's diagram, Fig. 1, to show the results found at the Stevens Institute. The vertical line of figures are degrees Fahrenheit, showing temperatures of preparation while the horizontal line of figures show temperatures of ignition.

Charcoal made at 500° ignited at 650°, or just about what pine in its natural state will ignite at. When it is made at 1,000° it ignites at 800°, for the reason that less of the inflammable or gaseous elements remain, and the purer the charcoal becomes. In other words, the less hydrocarbons there are, leaving nothing but pure carbon, the harder to burn. The upper number, 350°, on the scale of preparation, would be the temperature of about 125 pounds pressure of steam, and should the nearly hyperbolic curve which shows the points where the temperature of ignition occurs be continued it would still show that charcoal prepared at very low temperatures cannot be ignited much below 650° Fah., unless some unexplained assistance is given.

"Let it be borne in mind, however, that there is much evidence to prove that fires do take place just in the neighborhood of pipes (negative evidence though it may be), and that they should be protected most scrupulously by the steam-fitter."—THERMUS.]

HOW TO GET RID OF COCKROACHES.

PROVIDENCE, R. I., June 12, 1886.

SIR: In THE SANITARY ENGINEER of May 27, page 618, I noticed an inquiry, "How to get rid of cockroaches." I was told not long since by Mr. Normand N. Mason, one of our most reliable druggists, of a remedy which he said is a sure cure. It was so interesting to me that I thought it might interest others. He says that the cockroach is a cannibal, in that he will eat his own kind. The remedy consists in giving the bug a kind of phosphate paste; a few of the bugs eat some; then those cockroaches who do not get any set to work and kill those who were fortunate enough to get some, and tear open their stomachs, so possessed are they to get some of the paste; these bugs in return are killed by others, until there are no cockroaches left; the paste kills the last set. Mr. Mason tells me that at first he would not believe such a story, but that he has tried it and knows it to be true. This paste is made by J. H. Elleman, No. 9 Mathewson Street, Providence, R. I.

CIVIL ENGINEER.

Patents.

No. 341,924 is a patent for a grate and grate-bar, issued to Frank F. Landis, of Waynesborough, Pa., consisting of a series of grate-bars, each having longitudinal side bars and curved transverse bars integral therewith, and spaces between the latter, wider at the front end than at the rear end of said grate.

No. 342,140 is a patent for a double-piston water-meter, issued to Gerard Sickels, of Boston, assignor of one-half to E. B. Welch, of Cambridge Mass., and consists in the combination of the two substantially parallel piston-cylinders having inlet and outlet ports, the double chambered or divided pistons adapted to reciprocate and rock in said chambers, and provided with inlet and outlet ports adapted to coincide with the ports of the cylinders, and connecting devices, substantially as described, whereby the endwise movement of each piston is caused to partly rotate the other piston and thereby reverse its connections.

No. 342,544 is a patent for a steam-generator, issued to William Sellers, of Haverhill, Mass., composed of a series of saddle-shaped sections, and a rear section, each section communicating at each side by means of pipes with circulating-chambers, and each section communicating by pipes with steam-chambers at the upper portion.

No. 342,616 is a patent for a rain-water filter, issued to Benjamin Liggett, of Tucson, Ariz. In a rain-water filter, the combination, with the tank or receptacle having the inlet or leader pipe connected to its lower part and the discharge-pipe connected to the upper part, of the filter having the upper enlarged part fitting closely the said tank or receptacle and the perforated contracted part arranged to provide a water-space between the same and the said tank or receptacle.

No. 342,358 is a patent for a lubricator, issued to Timothy Holland, of Troy, N. Y., for the combination of a pipe constructed to attach to a support, a pivotal connection between said pipe and the lubricator, and a transparent passage-way for the oil passing from the lubricator, constructed and attached to move with the latter on its pivotal connection.

No. 342,684 is a patent for a feed-water regulator, issued to Frederick Cook and Burchard Thoens, of New Orleans, La., said Thoens assignor to said Cook. In a feed-water regulator an obstructor or valve deriving its motion from a float and working in an open-ended steam-pipe without any valve-seat, and so arranged as to never entirely shut off the flow of steam to steam pump or injector, so that the water-supply for a steam-boiler may be regulated.

No. 342,452 is a patent for a sink-connection, issued to James D. McEntee, of New York, N. Y., and constructed and arranged with a conically-shaped outlet and intermediate coupling, provided with upwardly-projecting rods, by which the strainer is drawn firmly down upon its seat in the sink, and a nut, and independent coupling.

No. 342,459 is a patent for an elevated-railway structure, issued to John H. Pendleton, of Brooklyn, N. Y., assignor, by direct and mesne assignments, to himself, Cornelius Tiers, Alexander H. Tiers, Robert I. Sloan, and Lincoln Moss, all of New York, N. Y., and Thomas Nast, of Morristown, N. J., for the combination, in an elevated structure, of columns, cross-girders, cross-bearers, and hanging supports between the cross-girders and cross-bearers, track-rails at and between the ends of the cross-bearers, and a cable for actuating a car-truck upon the tracks, and pulleys for supporting the cable.

No. 343,128 is a patent for a boiler-furnace issued to Edward J. C. Kelly, of Chicago, Ill, for a smoke-preventing device, the combination, with a combustion-chamber and one or more air-pipes communicating with said chamber and provided with an outer flaring end, of a short steam-tube placed on the inside of said pipe or pipes and terminating in a contracted conical discharge end and a conical wire coil attached to said conical end or nozzle.

No. 343,122 is a patent for a gas-furnace for melting metal in crucibles, issued to Henry H. Garrett, of Pittsburgh, Pa., assignor of one-half to Ralph Bagaley, same place, for the combination, in a furnace, of a melting-chamber having a lower hearth or bottom and an upper discharge-flue, and a series of supports of refractory material, each fitted in a horizontal guide-way or casing in the wall of the melting-chamber,

and having a narrow vertically-inclined inner face or edge adapted to fit against a melting-pot or crucible, and projecting into the melting-chamber above the hearth thereof.

No. 342,962 is a patent for a muffler for steam-valves, issued to Thomas E. Hill, of Rahway, N. J., for a main casting formed with an outer casing and flanges and a dome formed with flanges in combination with a valve, a box, a spring, and casing, and the levers for lifting the box.

No. 342,669 is a patent for a direct-acting pumping engine issued to Charles C. Worthington, of Irvington, N. Y., for the combination, with the main cylinder or cylinders and piston or pistons of a direct-acting engine, and a compensating cylinder or cylinders and piston or pistons arranged to act in opposition to the main piston or pistons during the first part of the stroke and in conjunction therewith during the last part of the stroke, of a slide valve or valves for controlling the admission and exhaust of the steam to and from the main cylinder or cylinders, the cut-off valve arranged in the induction-ports and having the arms and the lever or levers connected to the arms by the links and operated from some moving part of the engine.

No. 342,747 is a patent for a steam-boiler, issued to Sumner C. Higgins, of Cambridgeport, Mass, for the combination of an annular vessel provided with a charging-throat hollow annulus, the supporting brick-work of such annulus, a case, a steam-drum, and a series of upright prismatic or lozenge shaped vessel, such vessels, drum, and annulus being connected by pipes and arranged with each other to form an upright boiler.

No. 343,106 is a patent for a water-faucet, issued to Lewis E. Clark, of Lynn, Mass., for the combination, (with a faucet) having a partition between its inlet and outlet passages, and a valve-plug provided with a passage communicating with the said inlet and outlet passages, of a disk of flexible material closing the opening to the exit-passage under pressure of water and opening under pressure of air when the water-pressure is removed.

PERSONAL.

DR. GUY B. CHASE, of the Marine Hospital, Cleveland, O., has been elected Secretary of the Ohio State Board of Health, in place of Dr. Ashmun, resigned.

JACOB WREY MOULD, architect to the Park Department of this city, died June 14, aged 61 years. Mr. Mould, after university training in London and the study of his profession with the celebrated Owen Jones, came to New York in 1853 to superintend the building of All Souls' Church on Fourth Avenue in this city, for which, while in London, he prepared designs. In 1857 he became assistant to Calvert Vaux, architect of the Department of Public Parks, and in 1870 was made chief architect. In 1874 his leaving the country severed his connection with the Department, but in 1880, after his return, he was again connected with the Department.

Association News.

NATIONAL ASSOCIATION OF WATER-WORKS CONTRACTORS.—At a meeting of Water-Works Contractors, held at the United States Hotel, Boston, on the 15th of January, 1886, it was resolved to form an association for mutual benefit and protection, and to call a meeting at the Astor House, New York, on February 17, to which all water-works contractors were to be invited that could be reached. A much larger number than had been expected were present at the February meeting, and the Society was then organized under the name of The National Association of Water-Works Contractors. Its objects are the promotion and advancement of knowledge, scientific and practical, in all matters relating to the construction and management of water-works; the establishment and maintenance of a spirit of fraternity between the members of the association, by social intercourse, and by friendly exchange of information and ideas on the before-mentioned subject matters; the inducement and extension of more cordial and friendly relations between the water-works contractors, engineers and their patrons based upon the mutuality of interests and a recognition by all of the fact that each have rights which others should respect. The officers for the current year are: President, J. T. Langford, Boston; Vice-Presidents, Garwood Ferris, Jersey City; J. J. Newman, Providence; Secretary, Charles H. Eglee, Flushing; Treasurer, W. F. Inman.

CHICAGO MASTER PLUMBERS.—The Master Plumbers' Association met June 16, T. C. Boyd, President, and Joseph Alcock, Secretary. A seat on the platform was occupied by one of the oldest plumbers of Iowa, James Cameron, of Davenport, who said that the plumbers' associations in the West had done great service to the local trade. A report from the Sanitary Committee was read by J. J. Wade, its chairman, and stated great improvements had been made in Chicago sewerage and plumbing the past year. New houses had a much better ventilation than formerly. The Health Commissioner had approved the idea of having none but practical plumbers for sanitary inspectors, although he had been unable to carry out the idea. The plumber should be represented on the State and National Health Boards. Regarding the sanitary construction of residences, no pipes should be used except such kinds as are used by this city. The catch-basin should be abolished, and, instead, basins should be located underneath the sinks, and the grease coming from these sinks caught there—the basins to be copper or brass, with handholes. There should be no space underneath the floor of the cellar, as the odors from rats' banquets held therein often rived sewer-gas, and were mistaken therefor. Some new members were elected. The opinion was generally expressed that every man making application for plumbers' licenses should be licensed only after a State examination like that to which physicians are subjected. Only legislation could effect this. A committee on the subject was appointed, Messrs. Brooks, O'Hara, and Hamblin. The delegates for Deer Park left Chicago on Sunday night.

AMERICAN SOCIETY OF CIVIL ENGINEERS.—The annual convention of this society will be held at Denver, Colorado, July 2, 3, and 5, 1886. Sessions for professional discussion and one for the transaction of business will be held. After the close of the convention railway excursions will be made to a number of points of engineering interest in Colorado. The details of these excursions will be announced hereafter. They will probably include Greeley and the valuable lands reclaimed by irrigation in its vicinity, Georgetown, Leadville, Gunnison, and Pueblo. The excursions will probably terminate at Colorado Springs or Manitou, and the party start thence on its return East. Arrangements have been made with the railway lines for hauling a train for the transportation from the East of the members of the society, their ladies, and the few invited guests. It is intended by the committee to charter for the purpose a sufficient number of sleeping-cars to accommodate the whole party. These cars are to be retained for the round trip. This train will start from New York on the New York Central and Hudson River Railway on Tuesday, June 29, at 10 A. M. sharp, from the Grand Central Depot, and proceed via the New York Central and Hudson River Railway and the Lake Shore and Michigan Southern Railway to Chicago; thence to Denver, via the Chicago, Burlington and Quincy Railway. Members from Philadelphia, Baltimore, Washington, and intermediate points can probably best be accommodated by joining this train at New York. Members from Boston join the train at New York or Albany. Arrangements will be made for members from Pittsburgh to join the train at Cleveland. It is not possible to state exactly the cost to each person until sufficient replies to the circular have been received to enable the committee to determine with some accuracy the number of passengers on the train. If, however, the indications as to this number so far received prove correct, the price will not be far from \$60 for the round trip from New York to Denver and return. This will include transportation and one berth in a sleeper. Arrangements are in progress which the committee think will give satisfaction as to meals to be served on the train. This price will cover the round trip from New York and Albany, and the price will be equitably less from Buffalo, Pittsburgh, Cleveland, Toledo, Cincinnati, Louisville, Chicago, and St. Louis. Should the proposed attendance warrant it, arrangements will be also made for a special sleeper to leave Cincinnati and Louisville for St. Louis; the special cars thence will connect at some convenient point with the special train. Members are requested to transmit to the secretary the papers they are willing to present in order that a place may be given them in the programme. The families of members are invited to accompany them to the convention.

William R. Hutton, William H. Wiley, Robert B. Stanton, A. M. Wellington, John Bogart, R. E. McMath, Committee.

PHILADELPHIA ENGINEERS' CLUB.—The club met June 5, President Washington Jones in the chair; 30 members and one visitor present. Mr. J. E. Codman presented a paper on calorimetric tests of boilers. Mr. A. Marichal, introduced by the secretary, presented a mathematical discussion of question No. 3, as to whether or not the piston of an engine comes to an absolute rest at the end of its stroke. Mr. Marichal claims that it does. The secretary presented, for Mr. B. Ayres, of Philadelphia, an old time profile of Section 34 of the Gettysburg Extension of the Pennsylvania R. R. System, 1838. It was drawn by Mr. W. Hazel Wilson, the chief engineer. After \$1,000,000 was expended on the road the State abandoned the work. Mr. Ayres's contribution also included a copy of general profile of the Northern Pacific R. R., and one of the Bozeman Pass Tunnel on that road. A vote of thanks was returned to Mr. Ayres for these contributions to the library. The secretary presented, for Messrs. Wilfred Lewis, M. R. Muckle, Jr., and Coleman Sellers, Jr., Chairman, the committee appointed for that purpose, a memorial notice of the late Theodore Bergner. The secretary exhibited the map of the first permanent tramway in America, which was described by Dr. R. P. Robins at the meeting on May 15, 1886.

A SANITARY CONVENTION will be held during October on the Eastern Shore of Maryland, under direction of the State Board of Health.

Notes.

For works for which proposals are requested, see also the "Proposal Column," pages 77 and 78

CONSTRUCTION.

PRELIMINARY surveys for the Fort Smith and Texarkana Railway are being made under direction of Col. Gus Noble.

SALT LAKE CITY.—The city is excited about insufficient water-supply, and it is urged that the recommendations of a recent committee for a reservoir and stand-pipe above the Empire Mill should be carried out at once; estimated cost \$50,000. Address Chief Ottlinger of the water-works.

NEW GLOUCESTER, ME.—A town hall will be built here. Contract let. J. J. Sturgis is chairman of the building committee.

GALVESTON, TEX., is suffering from a severe water famine.

LITTLE ROCK, ARK.—Articles of association have been entered into and filed by William Farrell, A. L. Horner, Thomas Laferty, R. D. Welsch, William Frank, and E. J. Buller, Jr., North Arkansas Railway; length, 25 miles. It will run from Ravenden Springs north to State line.

CHICAGO, ILL.—The Board of Education has ordered the contract for heating-apparatus for the West Division High School given to the Exhaust Ventilator Company at \$10,875; also that contracts be let for a 15-room school building on site of Welsh School, to aggregate \$47,027. The contractors are named in the order.

THE Committee of Water Supply of the Massachusetts Senate has reported a bill to incorporate the Bradford Water Company, with a capital stock of \$100,000 and authority to hold real estate not exceeding \$10,000, and issue bonds in amount not exceeding the paid-in capital stock. The town of Bradford may purchase the franchise, if it so desires.

RAILROAD BRIDGE.—It is settled that a railroad bridge over the Mississippi River at Memphis will be built by the Kansas City and Memphis Railroad and Bridge Company. Plans have been prepared and \$3,500,000 to \$4,000,000 pledged for the road and bridge. The project it is stated is sure to go through Congress. Address W. W. Schofield, of the Cotton and Merchants' Exchange, Memphis.

READING, PA.—The contract for erecting the silk mill for Grimshaw Bros. was awarded on the 19th inst. to Messrs. James M. Ritter and Thomas Haigh, of Allentown, for the sum of \$40,757. The other proposals were as follows: D. & W. C. Kutz, Reading, \$51,700; D. C. Roth and Peter W. Helfrich, Reading, \$54,960; Herman L. Rummel, Reading, \$62,559; L. H. Focht, Birdsboro, \$57,000; C. C. Frantz, Reading, \$66,800. The contract did not embrace the engine, boilers, and steam-heating, which may increase the total cost of the mill to exceed \$50,000.

BOSTON, MASS.—The Aldermen have voted to borrow \$500,000 for the construction of sewers.

An iron bridge, 90-foot span, is to be built across Root River, one mile south of Oakwood Station, Oak Creek, Milwaukee Co., Wis. Bids will be received until July 1, 1886, at the office of the town clerk. J. Foley, William Offerman, and Gotlob Dettmar, Supervisors.

ROCHESTER, N. Y.—Engineers Tubbs and Kuichling have purchased for the extension of the water-works 700 tons of straight pipe and specials of the Jackson & Woodin Manufacturing Co., Brunswick, Pa., for \$28.25 per net ton, and 2.62 cents per pound for specials.

ST. LOUIS, MO.—Abstract of proposals for high-service engine, No. 5, with boilers and appurtenances, opened June 15: Fulton Iron-Works, to furnish, deliver, and set up complete the pumping-engine, boilers, and appurtenances, \$132,000; St. Louis Iron and Machine Works, \$140,000; Holly Manufacturing Co., \$133,000; Smith, Beggs & Rankin Machine Co., \$140,000; N. F. Palmer & Co., \$147,500. Contract awarded the Fulton Iron-Works.

BRAINTREE, MASS.—On June 10 a special town meeting was held on the question of providing a water-supply, and the following committee was appointed: E. Avery, A. C. Drinkwater, Asa French, J. L. Knight, J. I. Stevens, A. S. Morrison, Alverdo Mason, Elisha Thayer, A. W. Stetson, F. A. Hobart, H. A. Monk. Adjourned to June 23.

NEW BEDFORD, MASS.—On June 10 City Council voted that a portion of the new trunk sewer should be constructed, and the issue of \$30,000 of sewerage bonds was authorized.

GAS COMPANY TUNNEL.—The Chicago Gas-Light and Coke Company has taken out a permit to construct a tunnel under Chicago River at Taylor Street for its gas-mains. The cost is estimated at \$50,000, and the work will be done under the direction of the City Engineer.

BARABOO, WIS.—Water-works will be built here.

RED CLOUD, NEB.—This town wants a system of water-works.

COLUMBUS, S. C.—The new city water-works, which were recently washed away, are being rebuilt. The old works are able to supply only one-half the quantity of water needed.

GAINESVILLE, GEO.—A system of water-works is being agitated here.

CAPE COD, MASS., CANAL.—It is stated that on June 9 arrangements were made with New York capitalists to advance funds for constructing the canal. Frederick A. Lockwood is the contractor.

NIAGARA PARK IMPROVEMENT.—At a meeting of the commissioners, June 10, at Niagara Falls, the matter of a general plan for laying out the grounds was referred to Messrs. Dorsheimer and Green, who are to employ landscape architects and submit a plan to the board. Messrs. Olmstead and Vaux will probably be asked to act jointly with them.

OHIO WATER-WORKS BOUGHT.—Samuel R. Bullock & Co., New York, have bought the franchises and property of the Massillon, O., water-works for \$50,000. The officers now are: President, E. Waltman, New York; Vice-president, Colonel J. Walter McClymont, Massillon; Treasurer, John G. Warwick, Massillon; Secretary, Hon. Ellis Morrison, New Castle Pa., who also, with Hon. William A. Schultz, Lancaster, O., constitute the directory. The company proposes to spend about \$150,000 on the works.

NEW YORK HARBOR.—Press dispatches from Washington say that the Senate Committee on Commerce has agreed to insert in the River and Harbor Bill an appropriation of \$1,000,000, to improve New York Harbor. The plan, which is that of General John Newton, U. S. Engineers, provides for a stone dike running about S. S. E. from Coney Island to such a distance as shall be found necessary, and probably not less than four miles; the protection of the head of Sandy Hook, and the dredging of a thirty-foot channel from deep water near Sandy Hook to deep water below the Narrows.

HUDSON RIVER DREDGING.—Proposals for dredging about 14,000 cubic yards of material from the river, opposite Bath, were recently opened by State Superintendent of Public Works Shanahan, and the contract awarded to E. M. Payn, of Albany, at 9½ cents per cubic yard.

DULUTH, MINN.—A contract has been made with Youngre & Gleason, of Minneapolis, to build the Superior Street sewer; price, \$29,260.

MILWAUKEE, WIS.—A large number of city contracts were let by the Board of Public Works June 11, the largest of which was for putting in a brick sewer in Galena Street, from Third to Tenth Street, at \$5.37 per foot.

NEW YORK.—The Commissioners for Building the Harlem River Bridge decided on June 11 to reject all bids.

CHICAGO.—The City Council authorizes the North Chicago City Railway Company to run its cars by underground cable, and is about to pass an ordinance giving the company the use of La Salle Street tunnel, connecting the north and south divisions of the city.

The Armory lot is leased to S. W. Allerton for 99 years, at \$12,000 annual rental, and the "live stock king" will build a \$150,000 business block.

SYRACUSE, N. Y.—The Mayor, Council, and Commissioners of the Board of Health last week visited Oneida Lake to get data for action on deriving a water-supply from it.

BURLINGTON, VT.—It is understood that the contract for building the new reservoir will be awarded to A. B. Fisher & Co. Bids were opened June 14.

ALBANY, N. Y.—The Special Water Commission met on June 14 to discuss plans and specifications for the proposed driven-well system of water-supply. As soon as the specifications are completed bids will be asked for.

LAKE, ILL.—The contract for the Ashland Avenue sewer has been awarded to Michael O'Brien at \$39,767.98.

WATERBURY, CONN., SEWERAGE.—On June 30 the Sewerage Commissioners will open bids for constructing sewers in certain streets. F. Floyd Weld is City Engineer.

PHILADELPHIA.—The improved sewerage project, to which we have in previous issues referred, is earnestly agitated. On June 17 resolutions were adopted by the Board of Health asking councils to authorize "a scientific investigation of the sewerage system of the city" at an early day. This action was taken in response to a petition of citizens.

WATER-WORKS.—Camden, N. Y., wants water-works, and proposals will be received by the Water Commissioners, at the office of Dr. H. G. Dubois, a commissioner, until June 29.

MONTREAL, CAN.—The City Surveyor has nearly completed plans of the upper-level sewer. It is expected that bids will be asked for in a few days. There will be about 3½ miles of sewer. About 17,000 feet of this will be from 5 feet to 7 feet in diameter.

FOND DU LAC, WIS.—Mr. Benezette Williams, C. E., of Chicago, has presented a report on sewerage to the Mayor and Council. He recommends the separate system of pipe-sewers, six to eighteen inches in diameter, with automatic flush-tanks.

HUDSON RIVER IMPROVEMENT.—On June 14 the contract for removing 7,000 cubic yards of material from the Hudson River, at Fish-House Bar, was awarded to P. W. Meyers, of Albany, at 11 cents per yard. E. M. Payne bid 14½ cents.

LAKEWOOD, N. J.—Mr. Dana C. Barber, C. E., of Philadelphia, is preparing plans for the drainage of this winter resort.

EXETER, N. H.—Messrs Wheeler & Parks are constructing water-works here. The supply will be obtained from a well on the Mrs. Weaver property. The system includes a stand-pipe with a capacity of about 150,000 gallons, and about nine miles of cast-iron mains. The company guarantees to furnish 3,000,000 gallons of water daily. The town has contracted with the company to take fifty hydrants and water for fire purposes for twenty years.

COMPETITION FOR PLANS.—The Board of State House Commissioners for the State of Kansas will receive competitive plans for the completion of the central portion of the State House at Topeka, Kan., at their office in Capitol Square, Topeka, Kan., on the 4th day of January, 1887. The plans are to consist of first, second, and mezzanine floor plans, south and east elevations, and transverse and longitudinal sections, all to a scale of eight feet to an inch, size of plan to be governed by plans of basement story, already adopted, to be seen

at the office of the board, style of architecture to be in harmony with the wings already built. The Board of State House Commissioners will employ skilled assistants to sit with them as an Awarding Committee. The Board of Commissioners will pay \$2,000 for the best plans submitted, and \$1,000 for the second best. The plans for which premiums are awarded will become the property of the State of Kansas, with the right to use the whole or any part or any modification thereof without further claim from the authors for compensation or employment. Carefully prepared estimates of the cost of erecting and finishing the building will be required to accompany each plan submitted. E. B. Allen, Secretary of the Board.

PUMPING-ENGINES WANTED.—Until July 22 bids will be received by the Hamilton, Ont., Water-Works Committee, for pumping-engines with a capacity of 8,000,000 gallons in twenty-four hours. Address the Chairman of the Water-Works Committee at the City Hall. Forms of specifications and bid may be obtained from W. Haskins, C. E., manager of the water-works.

SANFORD, FLA.—The plant for the new gas-works at Sanford, Fla., will cost between \$30,000 and \$40,000, and work will be begun not later than September 1, and be rapidly pushed to completion.

MILWAUKEE, WIS.—The Board of Public Works will advertise for a 6,000,000-gallon pumping-engine for the North Side Pumping-Station.

The work of surveying for the new dummy line from Milwaukee's northern limits to Whitefish Bay is going on rapidly, and the Common Council have granted the right of way. The amendments to the ordinance require the company to keep the pavements between the tracks and for one foot on each side of the outside rails in good order.

PHILADELPHIA.—Proposals were opened at the Water Department for five steel boilers for the Spring Garden pumping-station, and also for two steel boilers and connections for the Roxborough Works, and the following bids were received: Robert Wetherill & Co., \$21,500 for the five, and \$9,550 for the two; Southwark Foundry and Machine Co., \$34,140 and \$11,555; William Cramp & Sons, \$22,800 and \$7,950; Henry Warden, \$28,385 and \$10,205; H. A. Ramsey & Son, Baltimore, Md., \$34,418 and \$13,550; J. P. Morris Company, \$19,990 and \$6,975; Edgemoor Iron Co., of Wilmington, \$23,545 and \$8,458; John Best & Son, of Lancaster, Pa., \$36,380 and \$14,000; Sidebotham & Powell, \$9,150 for the two; Hilles & Jones, of Wilmington, \$10,800 for the two.

Also for ten 48-inch stop-valves, two of which to be of the old style screw lift, and eight of a new department design. The following were the bids received: John I. Dawson & Brother, \$695 each for the old style ones, and \$947 each for the others; William Cramp & Son, \$12,450 for all; Camden Iron-Works, \$6,300 for all; W. H. Green, \$1,468 for the two old style ones, and \$938 for one of the new style ones, and \$5,390 for the other seven.

The Southwark Foundry and Machine Co. received the award, being the lowest bidders, at \$1,620 for the old and \$4,540 for the new style ones.

Bids were opened at the Survey Department for the construction of a new iron bridge over the Schuylkill River at Market Street 77 feet wide, and including approaches, masonry, pavements, etc., and the following were received: Edgemoor Iron Company, Edgemoor, Del., \$294,449; New Jersey Steel and Iron Company, of Trenton, N. J., \$277,638.50; Jones & Benner Company, 248 South Third Street, Philadelphia, \$311,000; Keystone Bridge Co., Pittsburg, \$308,000; Phoenix Bridge Co., \$294,205; and R. A. Malone & Son, of Philadelphia, \$271,000. The last bidder received the award.

Chief-Engineer of the Water-Works Ogden sent on June 15, to the Water Committee, a plan for a water-supply for Bridesburg; cost, \$40,500. Mr. Ogden was given power to act in the matter.

GOVERNMENT WORK.

SHREVEPORT, LA.—Synopsis of bids for lathing and plastering for Post-Office and Court House, Shreveport, La., opened June 14, 1886: Smith & Crimp, \$2,757, deduction if wood laths are used, \$375; Joseph Eastman, \$3,083; deduction if wood laths are used, \$450; H. & J. Millon, \$2,460; deduction if wood laths are used, \$480; Kearns & Shugrue, \$3,989; deduction if wood laths are used, \$429.

NEBRASKA CITY, NEB.—Synopsis of bids for concrete foundations, stone, brick, iron, terra-cotta, and other work for Court House,

Post-Office, etc., opened June 19, 1886: C. B. Bickel & Sons, Nebraska City, Neb., \$39,450; time to complete, one year; Bedford stone. Smith, Sergeant & Co., Topeka, Kan., first bid, \$39,512; one year; Bedford stone; second bid, \$39,100; one year; Bedford and Warrensburg stone. Harry Wales, Nebraska City, Neb., \$37,500; July 1, 1887; Bedford and Warrensburg stone. Fabien S. Potvin, Lincoln Neb., \$34,300; seven months; La Platte and sandstone unknown. McCarthy & Corbett, Washington, D. C., \$39,460; one year; Bedford and Warrensburg.

[TOO LATE FOR CLASSIFICATION.]

PROPOSAL.

PLASTER MODELS AT ABERDEEN, MISS., BALTIMORE, MD., GALVESTON, TEX., MINNEAPOLIS, MINN., PENSACOLA, FLA., PITTSBURG, PA., QUINCY, ILL., SYRACUSE, N. Y., ST. JOSEPH, MO., AND NEBRASKA CITY, NEB.—Treasury Department, Office of Supervising Architect, Washington, D. C., June 19, 1886. Sealed proposals will be received at this office until 2 P. M. on the 6th day of July, 1886, for furnishing the plaster models for ornamental work required for public buildings at the places above named, in accordance with drawings and specification, which may be seen and any additional information obtained at this office. Bids must be accompanied by a certified check for \$100.

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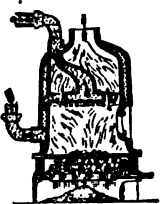


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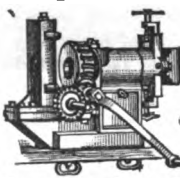
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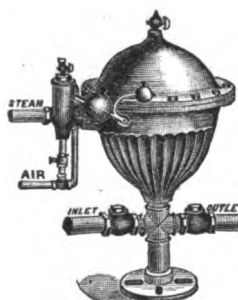
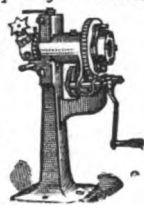
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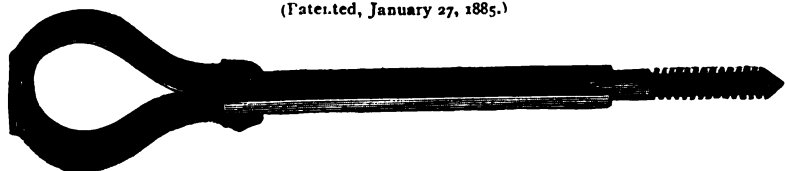
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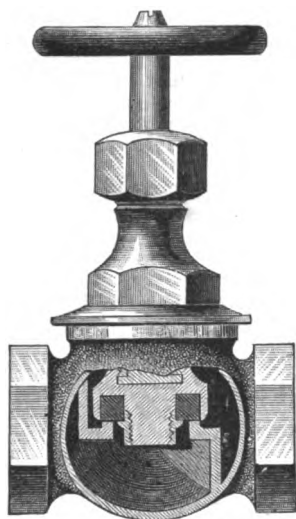
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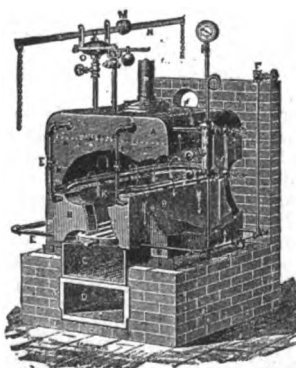
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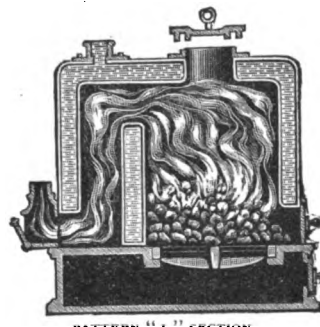
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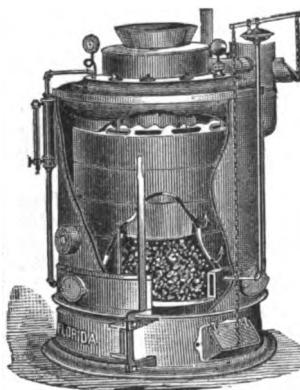
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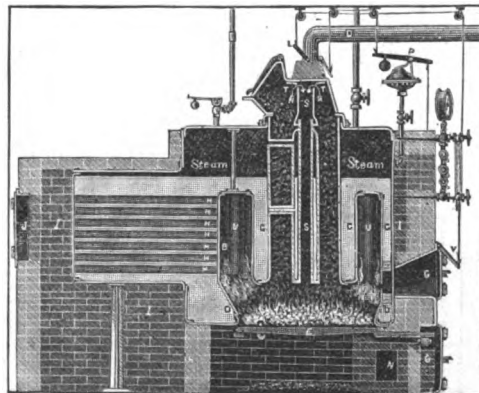
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ABSURD LEGISLATION.

SENATE Bill No. 2,667, introduced June 16, 1886, is entitled "a bill for the prevention and cure of contagious and infectious diseases in the District of Columbia." It recites that "whereas Dr. Mathien Sonvielle claims to have discovered a perfect method, not heretofore known, for the prevention and cure of all contagious and infectious diseases by destroying the germ of said diseases and purifying the air, water, and so forth, * * * therefore be it enacted that the Commissioners of the District of Columbia be, and they are hereby, authorized and empowered to contract with and employ the said Mathien Sonvielle to introduce and use his said method and system in said District: *Provided*, that after a thorough investigation of said method they shall be of the opinion that it is desirable to do so."

Senator Harris, who introduced the bill, is careful to state that he did so "by request," and there is not the smallest probability that it will become a law, or that, if it did, any action would be taken under it; but it may be characterized as absurd legislation to even print such a nonsensical proposition.

Dr. Sonvielle's proposition is to disinfect large masses of air by what he calls vaporous gases, meaning, probably, ozone and sulphurous acid.

To any one who knows anything of practical disinfection the proposition is absurd in itself, and we only notice it as an amusing illustration of pseudo science, which might possibly receive consideration from certain boards of aldermen, but which it is a waste of public money to print as a Congressional bill.

VITAL STATISTICS OF THE UNITED STATES.

It is said that those who have had the most to do with the collection and compilation of statistics have the least respect for them; and, in one sense, this is no doubt true—that is, with regard to statistics the derivation of which are not known. The man who wants statistics to confirm a certain preconceived idea, or to use in an argument against opponents, is not apt to question the accuracy and value of the figures which favor his view; but the statistician, whose aim is to get at the absolute facts, questions the accuracy and completeness of all his data, seeking to discover the limits of probable error in the results, and to enable his readers as well as himself to judge of the reliability of his conclusions.

It is because he feels bound to do this that the ordinary reader often is led to think that the statistician has no belief in his own work, and that it is of little value. These reflections have occurred to us in examining the report on the mortality and vital statistics of the United States, as shown by the tenth census. This report, prepared by Dr. J. S. Billings, U. S. Army, with the accompanying tables, makes two large volumes, the first of which was published several months ago, and the second of which is just ready for issue, and it contains a large amount of interesting information.

Dr. Billings points out the incompleteness and the inaccuracy of the data relating to births and deaths furnished by the census returns, and illustrates this so clearly and repeatedly in the course of his report that there is some danger that the casual reader may think that the conclusions he arrives at have no sufficient foundation. This idea, however, would be quite erroneous, for the various errors due to the imperfection of the data have been carefully considered and allowed for, and the results arrived at are not only the best obtainable, but probably do not differ from the truth more than what might be accounted for by the variations which occur from year to year. For example, his conclusion is that the death-rate for the whole United States for the census year was 18 per 1,000, but he says that there is a possible error in this of 1 per 1,000—that is, that it may have been only 17, or as much as 19. Now while it is true that it is possible that either of these extremes was the true figure, it is by no means probable that the estimate of 18 per 1,000 is more or less than the correct figure by one-half per 1,000, and it is therefore a perfectly safe standard for comparison. Comparing it with the rates of some other countries for the year 1880, we find that in England and Wales the rate was 20.5; in the rural districts of England, 18.5; in Sweden, 18.1; in Belgium, 22.4; in the German Empire, 26.1; in Austria, 29.6; and in Italy, 30.5.

The mean annual birth-rate of the United States is 36 per 1,000 of population, and the annual increase of our population from the excess of births over deaths is therefore nearly two per cent. a year. This is exclusive of the increase from immigration. The mean annual birth-rates of some foreign countries are as follows—viz.: England and Wales, 35.4; Sweden, 30.2; Denmark, 31.9; Belgium, 32; Austria, 39.1; German Empire, 39.3. As usual the high death-rates go with the high birth-rates, both occurring under like circumstances, and a high death-rate in infancy tending to increase the birth-rate, because with the loss of the infant and cessation of nursing the probabilities of a fresh pregnancy increase. The birth-rate is greater among the colored than among the whites, but this difference is less in the rural districts than it is in the cities.

Taking 23 counties in the South containing cities or large towns, and having an aggregate population of 588,129 whites and 586,038 colored, we find that the birth-rates per 1,000 of living population were, for the whites 28.71, and for the colored 35.08; while in 51 Southern counties containing only very small towns, and having an aggregate population of 542,705 whites and 591,336 colored, the birth-rates were: white, 34.31; colored, 39.46.

For each 100,000 male births there were 95,469 female births. In the colored population the relative proportion of female births is larger, being nearly 99 to 100 males.

The ordinary mode of reckoning the birth-rate—i. e., by comparing the number of births with the total number of the living population—would

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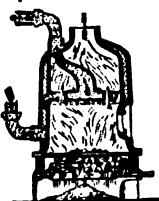
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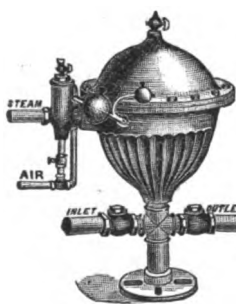
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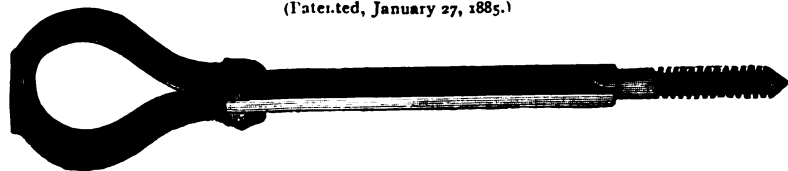
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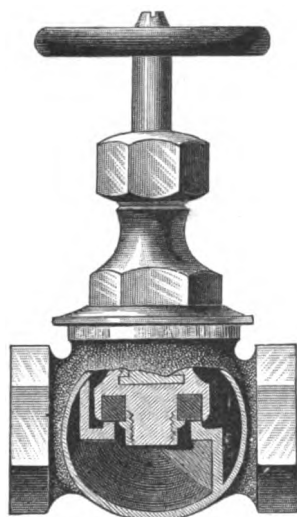
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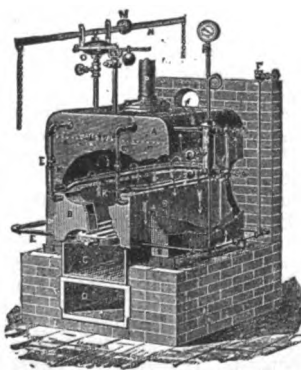
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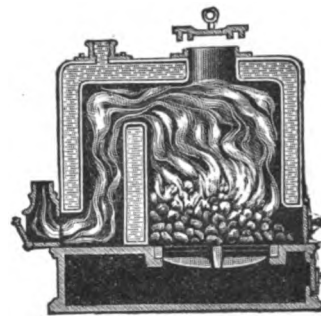
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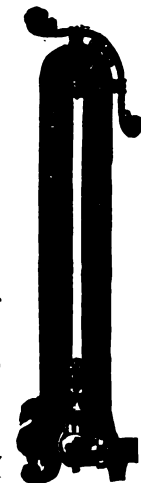
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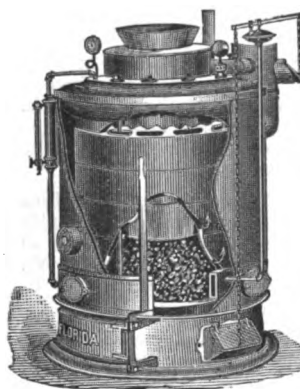
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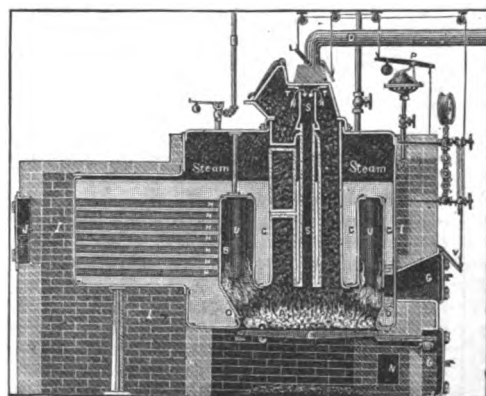
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ABSURD LEGISLATION.

SENATE Bill No. 2,667, introduced June 16, 1886, is entitled "a bill for the prevention and cure of contagious and infectious diseases in the District of Columbia." It recites that "whereas Dr. Mathien Sonvielle claims to have discovered a perfect method, not heretofore known, for the prevention and cure of all contagious and infectious diseases by destroying the germ of said diseases and purifying the air, water, and so forth, * * * therefore be it enacted that the Commissioners of the District of Columbia be, and they are hereby, authorized and empowered to contract with and employ the said Mathien Sonvielle to introduce and use his said method and system in said District: *Provided*, that after a thorough investigation of said method they shall be of the opinion that it is desirable to do so."

Senator Harris, who introduced the bill, is careful to state that he did so "by request," and there is not the smallest probability that it will become a law, or that, if it did, any action would be taken under it; but it may be characterized as absurd legislation to even print such a nonsensical proposition.

Dr. Sonvielle's proposition is to disinfect large masses of air by what he calls vaporous gases, meaning, probably, ozone and sulphurous acid.

To any one who knows anything of practical disinfection the proposition is absurd in itself, and we only notice it as an amusing illustration of pseudo science, which might possibly receive consideration from certain boards of aldermen, but which it is a waste of public money to print as a Congressional bill.

VITAL STATISTICS OF THE UNITED STATES.

It is said that those who have had the most to do with the collection and compilation of statistics have the least respect for them; and, in one sense, this is no doubt true—that is, with regard to statistics the derivation of which are not known. The man who wants statistics to confirm a certain preconceived idea, or to use in an argument against opponents, is not apt to question the accuracy and value of the figures which favor his view; but the statistician, whose aim is to get at the absolute facts, questions the accuracy and completeness of all his data, seeking to discover the limits of probable error in the results, and to enable his readers as well as himself to judge of the reliability of his conclusions.

It is because he feels bound to do this that the ordinary reader often is led to think that the statistician has no belief in his own work, and that it is of little value. These reflections have occurred to us in examining the report on the mortality and vital statistics of the United States, as shown by the tenth census. This report, prepared by Dr. J. S. Billings, U. S. Army, with the accompanying tables, makes two large volumes, the first of which was published several months ago, and the second of which is just ready for issue, and it contains a large amount of interesting information.

Dr. Billings points out the incompleteness and the inaccuracy of the data relating to births and deaths furnished by the census returns, and illustrates this so clearly and repeatedly in the course of his report that there is some danger that the casual reader may think that the conclusions he arrives at have no sufficient foundation. This idea, however, would be quite erroneous, for the various errors due to the imperfection of the data have been carefully considered and allowed for, and the results arrived at are not only the best obtainable, but probably do not differ from the truth more than what might be accounted for by the variations which occur from year to year. For example, his conclusion is that the death-rate for the whole United States for the census year was 18 per 1,000, but he says that there is a possible error in this of 1 per 1,000—that is, that it *may* have been only 17, or as much as 19. Now while it is true that it is *possible* that either of these extremes was the true figure, it is by no means *probable* that the estimate of 18 per 1,000 is more or less than the correct figure by one-half per 1,000, and it is therefore a perfectly safe standard for comparison. Comparing it with the rates of some other countries for the year 1880, we find that in England and Wales the rate was 20.5; in the rural districts of England, 18.5; in Sweden, 18.1; in Belgium, 22.4; in the German Empire, 26.1; in Austria, 29.6; and in Italy, 30.5.

The mean annual birth-rate of the United States is 36 per 1,000 of population, and the annual increase of our population from the excess of births over deaths is therefore nearly two per cent. a year. This is exclusive of the increase from immigration. The mean annual birth-rates of some foreign countries are as follows—viz.: England and Wales, 35.4; Sweden, 30.2; Denmark, 31.9; Belgium, 32; Austria, 39.1; German Empire, 39.3. As usual the high death-rates go with the high birth-rates, both occurring under like circumstances, and a high death-rate in infancy tending to increase the birth-rate, because with the loss of the infant and cessation of nursing the probabilities of a fresh pregnancy increase. The birth-rate is greater among the colored than among the whites, but this difference is less in the rural districts than it is in the cities.

Taking 23 counties in the South containing cities or large towns, and having an aggregate population of 588,129 whites and 586,038 colored, we find that the birth-rates per 1,000 of living population were, for the whites 28.71, and for the colored 35.08; while in 51 Southern counties containing only very small towns, and having an aggregate population of 542,705 whites and 591,336 colored, the birth-rates were: white, 34.31; colored, 39.46.

For each 100,000 male births there were 95,469 female births. In the colored population the relative proportion of female births is larger, being nearly 99 to 100 males.

The ordinary mode of reckoning the birth-rate—i. e., by comparing the number of births with the total number of the living population—would

be misleading in certain parts of the United States, owing to the fact that in those localities the proportion of the female population is comparatively small. Dr. Billings prefers to compare, for different localities, the number of births with the number of women living between the ages of 15 and 49. In this way the low birth-rate in the New England States as compared with the South and West is very apparent. Thus, the number of births during the year to each 1,000 females between the ages of 15 and 49 was, in New Hampshire, 71.6; in Massachusetts, 82.9; in Connecticut, 83.2; in Vermont, 88.7; in New York, 93.9; in Pennsylvania, 115.1; in Indiana, 122.4; in Iowa, 133.0; in Louisiana, 148.5; in Georgia, 156.0; in Texas, 187.4; and in Utah, 198.9.

The large birth-rate in the South is due in part, as above indicated, to the greater fertility of the colored race, but that of Utah is evidently due to another cause.

the proper remuneration for furnishing plans, specifications, and details, without superintendence, and a further $1\frac{1}{2}$ per cent. for superintendence. No self-respecting architect should ever work for less than this. We are surprised that any board of public works of a civilized community should expect to get good professional services at less than established professional charges.

OUR BRITISH CORRESPONDENCE.

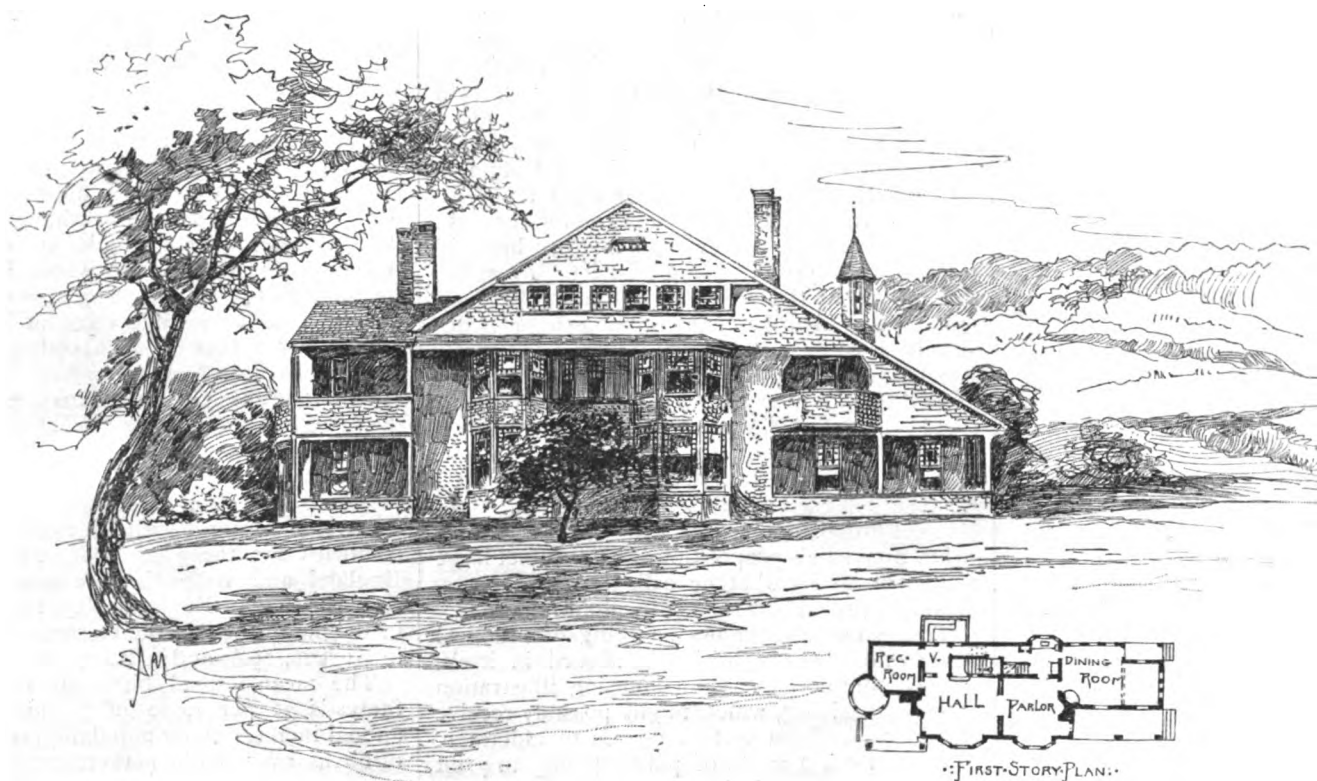
Novel Application of Electricity for Domestic Uses—Belfast Drainage Loan—Annual Dinner of the Association of Public Sanitary Inspectors—Favorable showing of the Croydon Water Department.

LONDON, June 12, 1886.

A NOVEL form of application of electricity for domestic use has just been put before the public here. A company has just been started with the object of supplying self-

tory. The main artery for the commerce of the town is the River Logan, a narrow stream running into and having its landing stages in the very heart of the town. The main drainage outfall at present is immediately above these landing stages. The results during hot summer months, when the water is well churned up by the screws of the steamships, may easily be imagined, and it is a marvel that the death-rate stands so low as 23. So far as the house-drainage is concerned, there is a general water-carriage system, except in the poorer neighborhoods, where, as a rule, the old-fashioned middens are in use, the occupiers of the houses being compelled by the Sanitary Inspector to clean out the receptacles and put the sewage on the land. The Executive Sanitary Officer of Belfast states that it is impossible to put water-closets in these houses—under say a £20 (\$96) rental—as the Irish of this class in the town have a playful habit of breaking up such articles whenever they have the slightest complaint against the landlord.

The Association of Public Sanitary Inspectors has just held its third annual dinner under the presidency of Mr.



A COUNTRY HOUSE AT COOPERSTOWN, N. Y.—BABB, COOK & WILLARD, ARCHITECTS.

The study of these birth-rates is especially interesting in connection with the subject of infantile death-rates. For the whole country the deaths among infants were, for the males 90.3, and for the females 73.2 per 1,000 of those born within the census year. More than half these deaths of infants occur during the first month of age. The death-rates of the population will be the subject of another editorial.

UNDERPAID ARCHITECTS.

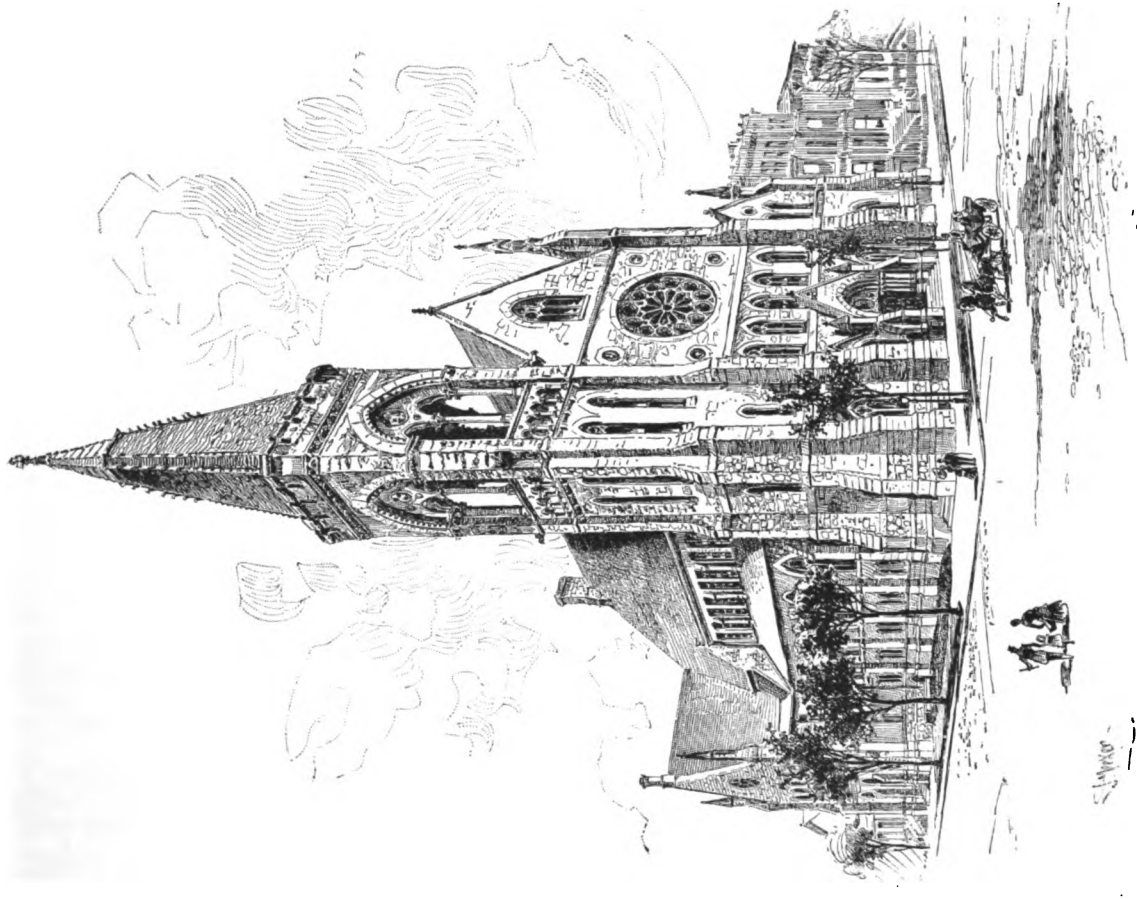
WE learn that the architects of Milwaukee refuse to finish any more plans for two per cent. on the cost of the structures. The Board of Public Works has been unable to obtain plans by advertising for some time.

This is not surprising. The wonder is that any architects should hitherto have been found to make plans for so slight a remuneration. As is well known, the schedules of the American Institute of Architects and of the Western Association of Architects fix $3\frac{1}{2}$ per cent. as

winding clocks, the winding being automatic, by electricity. Connection between a battery and the mainspring of the clock is made every hour through the medium of a small lug on the spindle of the hour hand, which permits the contact for four seconds, and is then "off." The form of use is certainly ingenious.

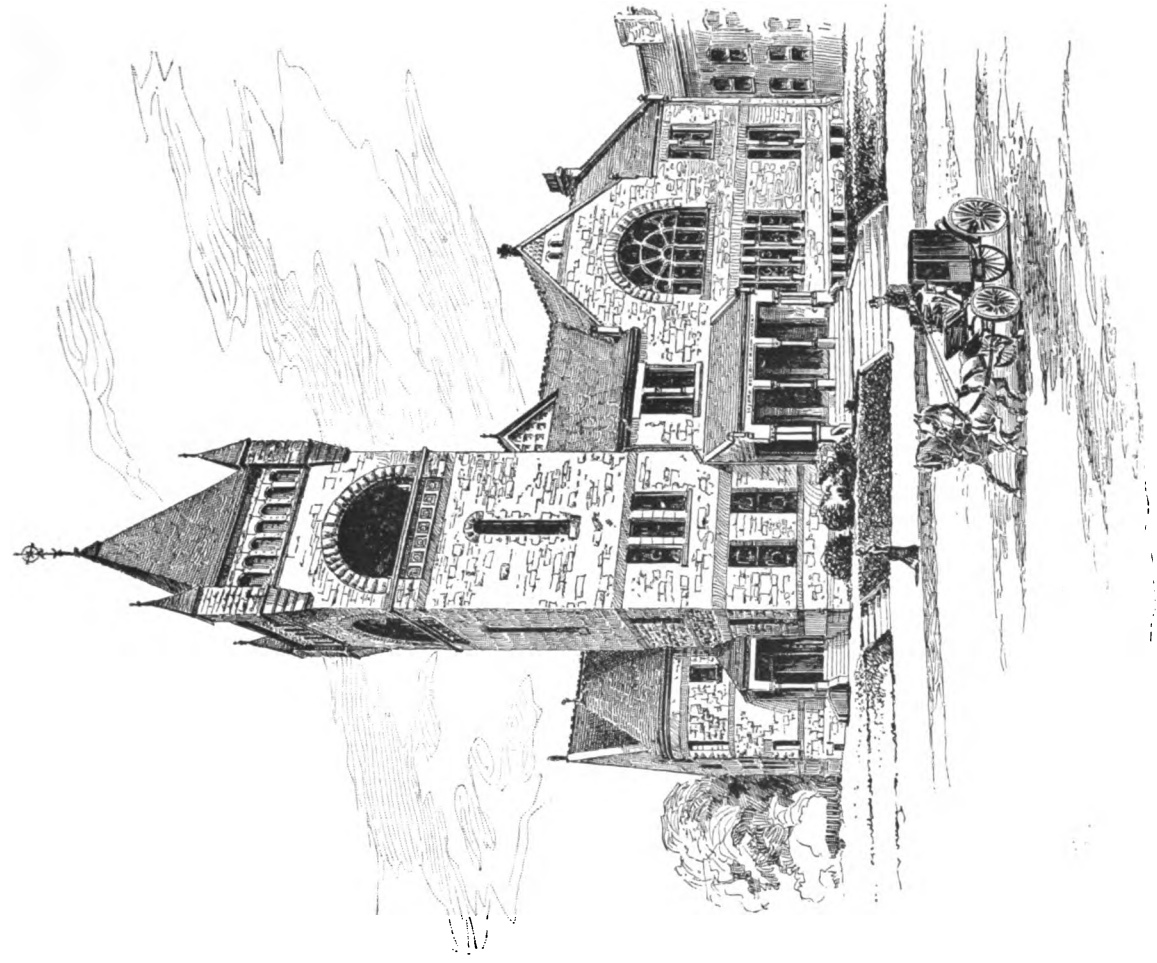
The authorities of Belfast, Ireland, have lately been trying to obtain parliamentary powers to enable them to raise a loan for the purpose of extending and improving their present drainage system, and to construct an intercepting sewer to carry the sewage out to sea. Unfortunately, the question has been made a party one, owing doubtless to the present unsettled state of the Irish question, and the Home Rule element has taken a revenge on the Orange centre, and caused the throwing out of the bill. It is much to be regretted, in the present instance, that larger powers are not vested in local authorities, enabling them to act on their own volition. The entire public debt of the borough is only some £350,000, a fact auguring well for the administrative ability of the Town Council, the more so as the lighting and scavenging of the streets, and the water-supply, are all highly satisfac-

Edwin Chadwick, C. B. Dr. Alfred Carpenter, in proposing "The Association," insisted, and unquestionably with great force, that the public sanitary inspectors appointed under the public health acts should, by rights, be paid out of the consolidated fund, instead of out of local rates as at present. This would make them Local Government Board servants, instead of being, as at present, literally the servants of the vestry. In the course of the evening the president also spoke. His text was the advantages of sanitation as compared with those of militarism. The cost of one by ship, as now constructed for the navy, say £1,000,000 (\$4,800,000) would, he said, suffice for the sanitation of 12 or 13 Malts, besides saving yearly some 100 lives, numerous cases of sickness, etc. He continued his comparisons, stating that the cost of two ships would suffice to produce the normal state of health at Naples, and that the sanitary deficiencies of Paris were solely due to the expenses of its armaments. There was certainly one charm in the speech: it was from quite a novel point of view. Apart from this, however, I think most people will feel regret that a veteran sanitarian should advance such extraordinary comparisons. The introduction of controversial matters of this type are not likely



THE SECOND PRESBYTERIAN CHURCH, CHICAGO.
JOHN ADDISON, ARCHITECT.

NEW YORK, VOLUME, XIV.



FIRST CONGREGATIONAL CHURCH, ST. LOUIS.
HURD & RICE, ARCHITECTS.

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TWO WESTERN CHURCHES.

to advance the cause of the "peace at any price" party, and it certainly will not do the cause of sanitation any good, even though it does it no harm. It is not in the slightest degree likely that even if a million of money were saved annually, or say for a single year, from the army and navy estimates, that any portion of that sum would be voted specially for sanitary purposes.

The Croydon Corporation and their engineer are to be congratulated upon the very favorable results shown in their balance-sheets of the Water Department for the past six years. The water-works are the property of the borough, and the unusual state of affairs is shown of a net profit balance of £14,642 (\$70,281.60) on the last six years' trading. Over the disposal of this sum the members of the corporation are "squabbling." The following table shows the yearly balances since 1881:

Year ending Lady Day.	Total receipts.	Revenue expenditure.	Balance receipts over revenue expenditure.
1881	£17,674 13s. 7d.	£15,581 8s. 7d.	£2,093 5s. 0d.
1882	18,124 10 7	15,761 15 7	2,362 15 0
1883	17,572 16 1	16,622 5 7	950 10 6
1884	16,800 17 8	15,099 14 7	1,701 3 1
1885	17,689 12 3	15,030 2 1	2,659 10 2
1870	18,091 1 9	13,207 0 2	4,884 1 7
	£105,953 11s. 11d.	£91,311 6s. 7d.	£14,642 5s. 4d.

There is constant supply at a good pressure; the water is of good quality and is delivered straight from the wells. The rate charged is exceptionally low. For example: The general supply to the outlying ward of Norwood (which is within the Borough of Croydon) is divided between the Corporation and the Lambeth Water-Works. A man renting a house of, say, £75 (\$360), supplied by the corporation, is rated at £3 (\$14.40) per annum. A man in the next road, perhaps, with a house of the same annual rental, but supplied by the Lambeth Company, has to pay £6 10s. (\$31.20), and that not for a constant supply. Instances of this nature are the best explanations of the strenuous opposition offered by the water companies generally whenever the question of terminating what is practically a monopoly of supply by the acquisition of the works on the part of the Government is raised. It is obvious that there is room for improvement and alteration in the state of affairs which permits one company to charge more than cent. per cent. for the supply of such a necessity, as compared with the charge made in the adjoining district for a better supply. SAFETY-VALVE.

OUR SPECIAL ILLUSTRATION.

SECOND PRESBYTERIAN CHURCH, CHICAGO, ILL.—JOHN ADDISON, ARCHITECT.

FIRST CONGREGATIONAL CHURCH, ST. LOUIS, MO.—HURD & RICE, ARCHITECTS.

OF the two churches we this week illustrate, the Second Presbyterian Church on Michigan Avenue Chicago, was designed by Mr. John Addison, architect, of Chicago. It is built of gray limestone.

The building of the First Congregational Church on Delmar Avenue, St. Louis, was dedicated in April, 1885. It is built of Cote Brillante limestone laid with quarry face, and has Bedford, Ind., cut stone trimmings. The open porch over the main entrance has polished granite columns. The tower has a red slate roof. The cross forming the finial is of copper. The tower is 22 feet square, and about 118 feet high to the top of the finial. The front of the building is occupied by parlors on the first floor, 13½ feet high, and a chapel or large Sunday-school room above, connected by a large doorway and swinging windows with one of the galleries of the church, so that it can on occasion be used as part of the auditorium of the church.

The plan of the church itself is a Greek cross, the width of the arms being 49 feet, and depth 14½ feet. Each arm of the cross has a gallery, the one opposite to the entrance containing the pulpit platform, with organ and choir gallery in the rear. The galleries are supported in the walls by trusses of Georgia pine, the auditorium being unobstructed by columns. The church will seat 620 persons on the floor, 288 in the galleries, and 350 in the chapel. The walls of the church inside are 26 feet high, and the room is finished to the roof ridge. The roof is carried in four hammer-beam trusses of Georgia pine, extending from wall to wall, and by diagonal trusses of similar design. The basement contains parlors and toilet-

rooms 10½ feet high. The parlors have wood dados 4½ feet high. The interior wood finish of the entire building is white wood stained the color of mahogany, except the pews. The pulpit and platform furniture are of solid mahogany.

The cost of the building, including steam-heat, pulpit furniture, pews, organ front, and decoration was about \$57,800.

The architects were W. Frank Hurd and W. A. Rice, of Boston, Mass. Mr. Rice is since deceased.

OUR ILLUSTRATION OF A MODERATE-COST HOUSE.

A COUNTRY HOUSE AT COOPERSTOWN, N. Y.—BABB, COOK & WILLARD, ARCHITECTS.

THIS house is the residence of R. V. McKim, Esq., at Cooperstown, N. Y. The house is covered with redwood shingles and the trimmings are painted a dark brownish green. The rooms in the lower story are finished in butternut.

The architects are Messrs. Babb, Cook & Willard, of New York.

SHEFFIELD, ENG., SEWAGE-PRECIPITATION WORKS.

SHEFFIELD recently celebrated the opening of the new sewage precipitation and filtration works. We abstract the following particulars from the *Sheffield and Rotherham Independent*. The precipitation-works are similar to those in use at Bradford, and were constructed from plans of Mr. G. Alsing, C. E.

The extent of the area drained is a little over six square miles (4,000 acres). All surface-water from fields, gardens, and open lands is excluded, and continues to flow in natural streams, but the drainage from all buildings, yards, streets, roads, and other parts occupied by population, enters the sewers.

The estimated average quantity of sewage which will be conveyed to the works on their completion is 10,000,000 gallons per day. The maximum flow at the present is half a million gallons per hour. The system of new sewers which is now being carried out has been designed by Mr. Charles Gott, M. I. C. E.

At the precipitation-works the sewage is run into four "catch-pits," each 143 feet by 15 feet, and 13 feet deep. These serve to catch the grosser particles by self-subsidence and the floating ones by screens.

Each two of these pits work together, and the sewage can be sent into either two by special drains closed off by penstocks. The solid matter which subsides to the bottom of these pits is removed at intervals by dredging machinery. The remainder of the sewage flows forward into what is called the mixing-chamber, where it receives the precipitant mixture, that at present used being milk of lime. The mixing is done without the aid of machinery, and, in fact, in a natural manner, by the concentration of the sewage at the point of mixture. From the mixing-chamber the sewage then leaves the building and flows out into the mixing channels, which surround the precipitation-tanks. Of the latter there are thirty, each capable of holding fifty thousand gallons of sewage, or one and a half million gallons in the whole. In these channels the sewage is further mixed with lime, and then it flows into the precipitation-tanks. There it rests for a couple of hours or so, and then the effluent water passes into filter-tanks (of which there are two for each precipitation-tank), through a couple of self-floating automatic valves, the invention of Mr. Alsing. The filtration material employed is coke, each tank having a bed five feet in thickness. These filters are so constructed that the filtration can take place intermittently, and thus increase the oxidation. Further oxidation is obtained by the water passing through artificial weirs, as it makes its way from the precipitation-tanks to the filters. On leaving the filters the effluent water has lost all smell, and is almost as clear as crystal; and in this condition it passes into a culvert, and so on to the main outfall and the River Don. So much for the liquid part of the sewage. What becomes of the deposit in the precipitation-tanks? This is run off into what is called a sludge-tank, from which it is pumped up by centrifugal pumps into one of three sludge ponds, each of which is 200 feet long by 80 feet wide. Here it undergoes a second process of precipitation similar to that in the precipitation-tanks. The effluent water also undergoes a second process, for it flows from the ponds into the mixing channels, and is treated as it was before.

The deposit is as destitute of smell as is the effluent water, and resembles a grayish kind of powder. Some persons imagined that the sewage-works and the processes carried on there would prove to be a nuisance; but the fact really is that there is no smell whatever. From the time that the sewage receives its mixture of milk of lime, all offensive smell is lost, and you can walk by the side of the tanks without for one moment discovering that what they contain is the sewage of a town of some 300,000 inhabitants. Only half of the tanks are at present required to be used.

Mr. Alsing describes the treatment as follows:

"(1) By self-subsidence of the heavier substances held in suspension, and the removal of these and floating matters, and their deodorization; (2) by precipitating the lighter bodies suspended in the sewage after the admixture of a precipitant—at present lime—which also acts as a deodorizer. The precipitation takes place in tanks, the sewage being completely at rest; (3) by oxidizing the effluent water from the precipitation-tanks by means of artificial weirs; (4) by filtering the effluent intermittently through suitable filter material—at present coke; (5) by removal of the sludge from the precipitation-tanks each time the effluent is run off, thus preventing decomposition." The main building at the head of the tanks is divided into several rooms. At one end are the boiler and engine-room and the mechanics' shop; the "catch" pits, the dredging machinery, and the mixing machinery occupy the central position; and at the other end are the lime-rooms. In the latter the lime is first slacked, and is then taken up by an elevator into a trough. Then it is propelled by a screw into four lime-mixing machines. Milk of lime is produced by these, and this runs into the mixing-chamber and meets the raw sewage as it comes from the "catch" pits. These machines are fed from tanks at the top of the building, and an electric tell-tale informs the person in charge when these tanks are empty.

SEWER ASSESSMENTS.

MR. F. H. WHITLOCK, C. E., of Waterbury, Conn., at a recent meeting of the Connecticut Society of Civil Engineers and Surveyors, in Hartford, read a paper on sewer assessments, in which he said:

"How shall we lay assessments for the benefits derived upon the parties benefited? I have purposely confined myself, in gathering information as to how this has been done in the past, to cities and towns in Connecticut. Sewerage works must, from their very nature, be paid for by those benefited by them. These persons are—first, the individual owners of property abutting directly on all lines of sewers; and next, the community at large. The benefits of a properly constructed system of sewerage are—first, the furnishing of a cheap, convenient, effective, and permanent means of disposing of all excremental and household waste matters; the providing a more or less thorough, inexpensive (to the individual at least), and convenient system of subsoil drainage which tends to improve all property adjacent to sewers by lowering the level of the subsoil water, and thus in many instances not only improving building sites, but actually making them.

"The community is benefited by the increased healthfulness and cleanliness of the city and the consequent reduction of expenses by the lowering of the death-rate and the fewer cases of sickness from the 'filth of preventable diseases,' and by the increased valuation of property always attending the growth of a proper sewerage system. Payment for this system must be an equitable one; one that will, as near as possible, distribute the payment in proportion to the benefit received. This can only be done by some method which will make the abutting property owners pay a portion and the community at large the remainder. The method adopted should be such as can be easily and speedily enforced, and not liable to be appealed from; such as will promote rather than retard speedy connection with the sewers. It should be guided by fixed rules and not dependent upon the views of a set of individuals (the set being varied, perhaps, for each case of laying assessment). Its provisions should be carried out by a board (not too numerous) of fair-minded and experienced men especially constituted for that purpose. This can be done by forming it at first by electing or appointing its members (say three in number) for one, two, and three years respectively, and have a new member elected annually.

"In all the places inquired of (Bridgeport, Birmingham, New Haven, New Britain, Hartford, Middletown, Nor-

wich, Waterbury), all but Hartford assess the abutters and the city at large, and in proportions varying from one-fourth to one-half for the city's share—except in the case of Hartford and Norwich, the first of which makes the abutters pay the whole, and the latter apportions it according to the ideas of a special committee appointed for the special occasion. New Haven, Birmingham, New Britain, Middletown, and Norwich confine the assessment to the street or section directly benefited, while the other three make some exceptions to this rule when the outlying property can be reached from no other sewer. All but Bridgeport and Norwich exempt corner lots from assessment on at least a part of one frontage—the exemptions varying from 25 to 100 feet—while Waterbury exempts one front if a lot lying between two parallel or nearly parallel streets is 125 feet deep or less.

"Birmingham and New Britain assess upon both frontage and area combined. Middletown and Waterbury confine their assessments to so much per front foot, while the other four trust to the judgment of a special committee who determine the amount of benefit accruing in each case, though in New Haven and Hartford it is by front foot. A perfect system of assessments should take into consideration the cost of the entire sewerage system, because each property is interested to a nearly equal extent in the whole system, aside from its special private interest in the sewer in front of it. Each part (even to the house connections and fixtures) must do its proper share of the work required of the whole. This seems to me a good reason for laying upon the city a portion of the expense; the city one-third, and abutters two-thirds. This proportion in some neighboring States is fixed by statute.

expense. The system of sewer assessment should take into consideration the interest which all have in the entire system."

ENGLISH PLUMBING PRACTICE.

BY A JOURNEYMAN PLUMBER.

No. LVI.

(Continued from page 12.)

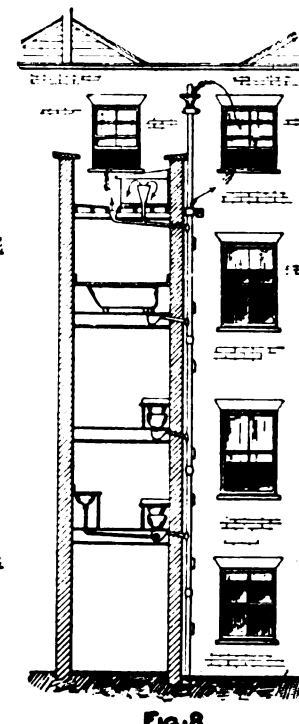
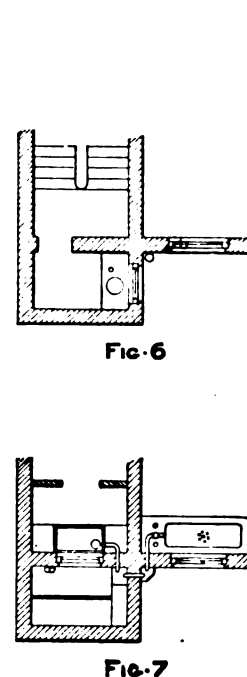
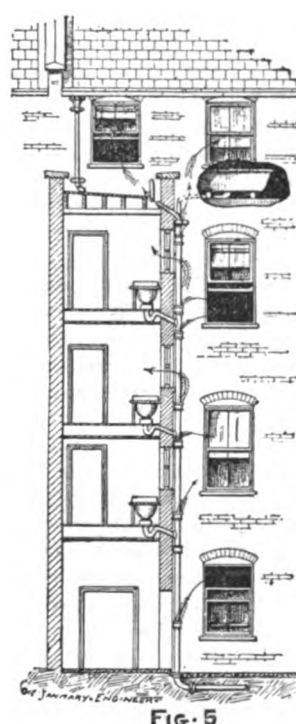
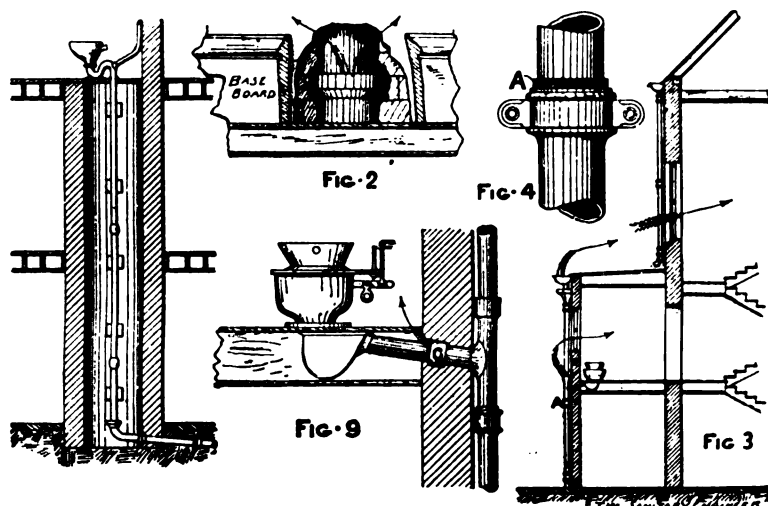
SOIL-PIPES.

At a very old historical building in London a retiring-place was found to be made at the top of a two-storied building and a shaft built in the walls for the purpose of conveying excreta to an opening leading into the River Thames. Figure 1 is a sketch section showing the shaft. A plain seat was originally fixed over the top of the shaft, until the stench that escaped became unbearable, when a water-closet basin and trap were introduced. As this did not improve matters very much, it was finally decided to fix a lead soil-pipe, as shown, the men and necessary materials being lowered from the top. A drain was also fixed from the bottom of the soil-pipe to an adjoining sewer. There is no doubt the shaft remains an evil, as the walls were partly covered with excreta, and it is more than probable that the smells from this can pass through into the adjoining rooms.

Some people are under the impression that anything in

house. Ordinary iron rain-water pipe is fixed up to A, when a short piece of lead pipe is inserted and a lead branch-pipe carried through the wall to the trap of the water-closet. Above this the vertical pipe is continued to eaves-gutter to receive the rain-water from roof. It is very rarely that the joints of the pipes are made air-tight, and, even if they were, smells escaping from the top of the vent and rain-water pipe can pass into any open window, as denoted by the arrows. The joints of the pipes, when made at all, are made of red-lead cement. If in the sun, these joints soon become defective. The expansion and contraction of the metal pulls the cement out of the socket, as shown in section, Fig. 4. In some cases when the cement has been finished flush with the top edge of the socket two or three days' sunshine will cause it to stand up from one-quarter to three-quarters of an inch, as shown at A, leaving a crack through which any smells can escape. The sun has no effect on iron pipes when fixed inside the house, but it is almost impossible to make sound joints to them. Out of some hundreds of tests made the writer has never yet found an iron pipe of this description to stand either the peppermint or smoke tests, defective joints being the rule and not the exception.

At a first-class (?) house in the west end of London the soil-pipe was of the same description as mentioned above, and also acted as a drain ventilation-pipe, the top end being connected to the gutter of the roof to receive the rain-water. It was complained that none of the back win-



"The value of land is not a fair basis upon which to assess benefits for sewerage, because its value is a variable quantity. And then again, which value would be taken, the value before the sewer is built or after? In either case how can it be determined? To assess by the front foot alone is simple, and might, with cast-iron rules, be made to work well. The opponents of this plan say it is unfair because a lot of 50 feet front and 100 feet deep is assessed as much as the next lot 50 feet front and 200 feet deep; and further, that the 50-foot front lot in the suburbs is assessed the same as the 50-foot lot in the centre. Now, I believe sewerage is more valuable to the suburban lot than to the central lot; and the latter pays much more than the former in taxes, and in the city's share of the expense of the entire system. Opponents of assessing by area say it is unfair, because a lot with little front and large rear and inconveniently situated to be drained into sewers pays heavily, while shallow lots with large frontage and easy of access to sewers pay a small amount. Another method might be by the use made of the sewers, the same way as the use of city water—by the number of persons using each connection, number of fixtures attached to the sewer, or by metering all water used and charging by the gallon. This last method would prevent water waste, and would be a good one if it could be adopted. To charge by the use would require a running account against every sewer-connection made, and a vast amount of book-keeping would be required. It seems to me that sewer assessments should be made systematically, and under certain broad rules, each of which should cover as many cases as possible. I would not advocate a system which allows the making of assessments over and over again. Nor would I tie the hands of a city when it becomes necessary to rebuild a sewer and compel it to bear the whole

the shape of a tube will do for conveying soil from a water-closet to a drain, and all sorts of schemes are practiced with that object, but with varying degrees of success. In some modern cases common drain-pipes have been fixed as soil-conduits. In other cases drain-pipes have been used and fastened to the walls of houses with pieces of hoop-iron. In another case common drain-pipes were built in a party-wall between two houses to act as a ventilator to the house-drains. After a week spent in fruitless search for the cause of smells in the drawing-room it was decided to take down the wooden skirtings. In doing this the wooden plugs, driven into the joints of the brick-work for fixing the skirtings to, came out, and a loose brick was also found. On removing this brick the source of evil was discovered.

Figure 2 is an illustration showing this. Drain-pipes, no matter how well the joints may be made in the first instance, are not to be trusted to either for the conveyance of soil or for vent-pipes to drains.

Zinc is not a proper material for soil-pipes. In some suburban residences, built by jerry builders, zinc pipe has been used, and, in less than twelve months, holes have been eaten through by the gases emanating from sewage. In some cases D-traps made of zinc have been discovered beneath water-closets; one exhibited at the Parkes Museum of Hygiene in London is literally all in pieces. In spite of the knowledge that zinc is not a good material to use, there are a great many cases where it is being put in by scamping builders.

A common way of fixing the soil-pipe at small residences is shown at Fig. 3, which is a section of a back part of a

dows could be opened on account of the smells that escaped from the pipes.

Figure 5 is part of the back elevation of the house, with the projection built for the water-closet shown in section. Figure 6 is a plan of one floor and Fig. 7 of the roof over projection, bath-room, and housemaid's closet. The sketches speak for themselves, the arrows denoting the evils complained of. The waste-pipe from the bath and the sink, which also received chamber slops, discharged on to the roof, which was offensive from the splashing of the slops. In addition to the defects pointed out, there were no traps beneath the sink or bath, so that the smells from the drains were laid on to the house by means of the waste-pipes.

This is not an unfair average specimen of a certain class of builders' sanitary work. In the above case the house was newly built, and, before it had been occupied six months, the purchaser had to spend about £250 in having the drains relaid and the whole of the internal plumbers' work renewed, and yet could get no redress from the builder, he being only a man of straw.

The writer could give numerous examples of this class of work, and cases where purchasers have tried to save a few pounds by not employing a sanitary expert to advise them, before purchasing a house, as to its sanitary arrangements, preferring rather to run the risk of being duped by unscrupulous builders.

Another example is given at Fig. 8 of one house in a street, all the others being arranged in the same careful (?) manner. In this case the soil-pipe was of lead up to the

point B, and the joints were properly soldered, but above that iron pipe was fixed to take the rain-water from the roof. The joints were not made air-tight, so that smells could escape. The head on the top end was dangerously near a window, but the greatest evils were the branch-pipe to carry off rain-water from the lower roof, which was only 2½ feet from a bedroom window, and the overflow from the cistern, which supplied drinking-water for the household, connected to the branch rain-water pipe. The arrows show the defective arrangements, which, perhaps, were the cause of the illness of the inmates and which led to the examination and discovery of the evils.

Figure 9 is a fragmentary section, showing a defect that recently came under the writer's notice. This was in the house of a medical officer of health. The stench in the water-closet was so great that it was thought advisable to take away the old pan water-closet and D-trap and fix a better kind of trap and an apparatus of a more sanitary description. The floor of the water-closet was taken up for access to change the trap, when it was discovered that a hole was eaten through the lead by sewage gases, so that it was necessary to change the branch soil-pipe. On cutting away the brick wall for that purpose a slip-joint was found, as shown at C. The discovery of this defect may almost be termed accidental, as it was hidden in the brick-work and could not be seen until the wall was cut away.

This is an example of how some builders plumb their houses. They will let the plumbing piece-work to some journeyman plumber, as unprincipled as themselves, at a price that would scarcely pay for good materials. The plumber, to make the work profitable, will make several T-pieces and solder short pieces of soil-pipe on to D-traps, which are generally made of five-pound lead, at his home. The T-pieces are sent on to the job and fixed, perhaps, by the bricklayer. A few days afterward the plumber will bring the traps, socket them in the branch of the T's, as shown at Fig. 9, and, after the carpenter has laid the floor, will fix the water-closet apparatus and pipes to flush them and the job is completed. The writer has known dealers of materials to go round and buy up old water-closet apparatus, do them up, and sell them cheap to the above class of builders.

It is to be hoped that the long-talked-of registration of plumbers in England will soon be a fact, and, in addition, that properly qualified inspectors of plumbers' work will be appointed, and laws passed to make it a criminal offence to do any plumbers' work in such a way as to be injurious to the health of the poor victims of people who have to live in the above kind of houses.

(TO BE CONTINUED.)

THE ANNUAL CONVENTION OF THE NATIONAL ASSOCIATION OF MASTER PLUMBERS.

WHEN Deer Park, Md., was selected for the plumbers' convention, the President of the United States was neither yet married, nor rumored of marriage, yet fate had it that this eminently practical body of men should follow the President's footsteps on his very different business of a sentimental order—and this was doubtless why so many of the wives and daughters also went along. To dwell within the shadow of a President's honeymoon was not an everyday affair.

Two things, at least, in a practical way were accomplished. The business of the convention was rushed through in two days' time, and the long-standing discussion over the interpretation of the trade protection policy was settled in harmony with the ideas of the Eastern men—to wit, discretion was given to local associations for making their own agreements with manufacturers and dealers, subject to approval by the Executive Committee.

The transportation facilities were uncommonly good, certainly from the East, and to the manager for the Baltimore and Ohio Railroad and to the committees of the association great credit belongs therefor.

The first session began in the West Annex of the Deer Park Hotel, at 11 A. M., June 22, President James Allison, of Cincinnati, calling the assembly to order.

The familiar appearance of all these conventions was repeated at this, the old faces, most of them, under the same banners, arranged alphabetically from front to rear; so placed Alton, Baltimore, Boston, Brooklyn, and Chicago in the front; St. Louis, Washington, and Wheeling in the rear. Most of the stand-bys, the familiar marks, so to say, were there—the resounding voice of Davlin, of Boston; the oratory of Mitchell, of New York;

and the attention-compelling personality of Collins, of St. Louis, were on hand. A few of the regulars were missing, but quite generally the convention was in the old hands.

The session began with a brief address of welcome by the president, and the appointment of the Committee on Credentials: McCoach, of Philadelphia; Wade, of Chicago; Remick, of Philadelphia; Whitelaw, of New York; Reagan, of Washington; and Keenan, of Brooklyn.

Then a recess was taken until 2 P. M. to await the report of this committee.

During the recess the following delegations were found to have presented credentials:

Alton, Ill., P. J. Kane; Baltimore, Md., J. A. Wilson, J. F. Dwyer, H. C. Bowman, D. J. Barry, T. J. Griffin, J. J. Cary; Boston, Mass., Isaac Riley, J. H. Stevens, J. Crawford, D. G. Finnerty, T. J. Tute, Henry Hussey, F. A. Titus, J. W. Cosden, D. A. Horgan, J. F. Davlin; Brooklyn, N. Y., George Cummings, J. W. Birkett, Thomas Hudson, G. B. Lewis, M. J. Lyons, P. M. Moffatt, J. J. Keenan, W. Gardner, O. A. Marron, E. McNamara, C. A. Wagner, H. M. Noble, J. H. Radcliffe; Canton, O., U. D. Theobald; Chicago, Ill., P. Nacey, Martin Moylan, Andrew Young, D. J. Rock, J. J. Wade, F. Ruh, W. Bowden, W. Sims, C. J. Brooks, G. Tipple, J. R. Alcock, D. Bain, J. J. Clark, Peter Williams, M. Ryan, M. J. Corboy, R. Griffith, T. C. Boyd; Cincinnati, O., R. Murphy, S. J. Nolan, Michael Burke, W. Lawson, James Semple, Robert Carlisle; Columbus, O., E. A. Futerer; Hampden County (Springfield, Mass.), E. L. Knight; Hudson County, N. J., Joseph Zumbusch, J. H. Kniffen, J. F. Blackshaw, Thomas Bowes; Indianapolis, Ind., J. G. Smith, J. C. Dunn; Kansas City, Mo., R. B. Farley, E. B. Kay; Kansas State, James Foley, W. F. McCartin, G. W. Kite, L. A. Beebe; Louisville, Ky., S. Schulhalter, M. J. Duffy, W. H. Matlock; Milwaukee, Wis., W. E. Goodman; Minneapolis, Minn., A. W. Scott, J. P. Courtney, E. C. Ceauvett; New Haven, Conn., D. F. Kelly, A. J. Clearkin; New York, John Byrns, John Mitchell, F. Reynolds, J. L. Pinkerton, John Miller, J. N. Knight, H. J. Gabay, E. J. Brady, W. H. Quick, T. Sullivan, Samuel Clark, W. I. Lightbody, J. A. Macdonald, I. O. Shumway, A. L. Whitelaw, John Renehan, Philip Smith, W. H. Richards, William Young, A. Low, Cauldwell Frazer, William Bishop, T. J. Tuomey; Philadelphia, W. W. Mentzinger, W. M. Wright, J. A. Heffron, Enoch Remick, G. F. Uber, W. M. McCoach, W. Harkness, Jr., J. J. Weaver, John Worthington, A. M. Hicks, J. M. Williams, J. E. Eyanson, W. L. Owens; Pittsburg, Pa., R. C. Wilson, J. Anderson, F. McKnight, J. Kennedy, J. G. Weldon; Providence, R. I., Patrick Tierney, Thomas Phillips, W. Whipple, T. A. Marrin; St. Louis, Mo., J. A. Lynch, J. P. Gallagher, David Roden, J. McCartin, J. A. Reardon, W. Norris, D. J. Collins, T. H. McMahon, J. Sheehan, W. Schwehr, O. J. Gerhard; Washington, D. C., E. J. Hannan, R. G. Campbell, James Reagan; Wheeling, W. Va., J. S. Trimble.

Though not present at the opening of the convention, Major W. E. Foster, of Norfolk, Va., arrived during the day and was made the representative of his city.

The results of the Credential Committee's action, as above, were presented to the convention after the recess, their report adopted, and the above-named delegations made constituent parts of the convention.

On assembly for the afternoon session a number of letters were read from associations which were not represented in the convention. Among those were letters from the San Francisco association, from Beatrice, Neb., Norfolk, Va., New Orleans, La., Denver, Col., Mobile, Ala., and Rockford, Ill.

The Wade-McGraw matter of last year got its public quietus in the report of the Select Committee, appointed last year on the matter, which was next presented by Mr. Boyd, of Chicago. It stated that the Chicago association having made an investigation, had found the charges against Mr. Wade unfounded, and that Mr. McGraw had withdrawn them. The convention would not hear a proposition that Mr. McGraw make a public apology, and, on motion of Semple, of Cincinnati, the report will be spread upon the minutes and the subject put an end to.

The report of the Executive Committee, which was looked forward to as one of the most important features of the convention, because of its recommendations with reference to the Baltimore Resolutions, was now presented. After reciting the business transacted at the meetings of the committee during the year, summaries of which have been given from time to time to our readers, the report presented the interpretation which the committee had given to the Baltimore Resolutions. It will be remembered that at the St. Louis Convention, by a resolution introduced by New York and amended by Mr. Young, of Chicago, the interpretation of the resolutions was left to the Executive Committee, and it seems worth while, although familiar, to present this interpretation, as it constituted a part of the committee's report. The first four resolutions are simply restatements of the original ones. Resolution 5 proceeds: "It is not the intention of the foregoing resolutions to prevent the interchange of patented or any other

plumbing materials between manufacturers and wholesale dealers in such goods or exchange for the export trade."

Resolution 6. No local association shall make any other agreement with manufacturers or dealers than the above.

The remaining resolutions, relating to the appointment of committees to enforce the regulations and to their necessity, are restatements of the original resolutions. The report closed with the following recommendations:

(1) That a majority of the Executive Committee should reside in the same city, or be located within a convenient distance of each other.

(2) That the sum of at least \$500 be placed subject to the order of the president or secretary for clerk hire for the Executive Committee.

(3) That the plumber should cease acting merely as an agent, and should endeavor to buy goods in large quantities in order to become himself a merchant. The committee did not believe he could be protected in any encouraging degree if he depended on others to carry the materials used in his own business.

(4) That discretionary powers be granted to local associations to make their own agreements with manufacturers and dealers in plumbing materials, subject to the approval of the Executive Committee.

The spirit of the old dispute over the Baltimore Resolutions between the Eastern and Western views showed in a little debate led off by Mr. Davlin, of Boston, in a proposition to table that part of the committee's report relating to the Resolutions until the convention reach "new business," as he said, to give time for consideration. He feared that if the report were accepted it would be held to cut off all attempts later to take the matter up again.

Mr. Macdonald, of New York, wanted to refer the recommendations of the report to a special committee, and, after some discussion, to get the matter clearly before the convention, this was agreed to, and a committee of five (Macdonald, of New York; Harkness, of Philadelphia; Finnerty, of Boston; J. J. Wade, of Chicago; and Hannan, of Washington) was appointed by the chair. Here occasion was taken to receive from Mr. Charles McKenzie, agent of the Baltimore & Ohio Railroad, a statement in regard to return tickets and an excursion to the Cheat River, and the thanks of the convention were tendered him.

The Recording Secretary, T. McNeil, of Cincinnati, presented his report summarizing the amount of printing, correspondence, etc., during the year, including the obtaining of a seal for the association and a plate for certificates issued to local associations. There had been paid out for printing, mailing, etc., \$672.62; 1,187 names of members in good standing were on the rolls of the association.

The report was ordered filed, and thanks tendered to the secretary.

The Financial Secretary, Enoch Remick, of Philadelphia, stated that there had been received from dues of the local associations \$2,381.58. The report was received with thanks to Mr. Remick.

Mortimer J. Lyons, of Brooklyn, Treasurer, reported that he had on hand \$1,159, with certain bills yet to be met.

It was voted that Mr. Lyons should complete the report as soon as it would be possible to ascertain the outstanding claims, and present it complete to the association.

Following the report of the Treasurer, the reports of the State Vice-Presidents were presented. For the District of Columbia, Mr. Hannan reported that the year had been an eventful one. In the early part of it they had had hard work to keep up the association, but had reorganized on a firmer basis, and now had eighteen members. One member had been expelled for violating his pledge not to employ journeymen who had struck on the basis of eight hours' pay for ten hours' work. The association expected, with the aid of Colonel William Ludlow, Engineer Commissioner of the District of Columbia, to be able to establish some examination of plumbers before allowing them to practice the trade.

For Kentucky, W. H. Matlack, of Louisville, reported that want of co-operation among the plumbers had retarded the association. Only in Louisville, among the towns of the State, are there more than one or two plumbers to form associations. Efforts had been made to affiliate them with the Louisville organization, and to revive that association.

For Kansas, J. Foley reported the association prosperous. Plumbers were not allowed to become members until they had passed an examination. He criticized the Missouri organizations for, as he said, taking their members from them. The claim of the hardware men to be considered plumbers he regarded a serious matter. He approved of the Baltimore Resolutions, and hoped the Kansas associations would soon come to the front rank among the bodies affiliated with the National Association, and that before many years it would meet in that State.

The State Vice-President of Maryland, John Trainor, of Baltimore, related the passage of the Maryland law relating to the regulation of plumbing in Baltimore; and stated that it provided for a board of five Plumbing Commissioners, of which three were master plumbers—viz., W. H. Rothrock, John Knipp, and himself. He favored the Baltimore Resolutions; some violations by dealers who had

signed were reported, which had been examined and found to be some unfounded and some well founded. One firm proved to have violated them, had resigned and renewed its obligations. In May he had addressed letters to all the manufacturers and dealers in the city of Baltimore, asking the effect of the Resolutions on their business. All the replies had been favorable to the Resolutions. Baltimore supported the Resolutions, but favored a liberal policy toward those associations which thought they were injured by them.

For Missouri, Mr. Gallagher, of St. Louis, stated that his efforts had been given to organizing and strengthening the associations in the small towns. He had tried to overcome the small local jealousies, had advised two or three towns to unite together to form an association when one was not strong enough. He hoped a State association would be formed; but he had found that many of the plumbers in the small towns wanted protection, without, however, trying to protect themselves. They were like Burri's boarders in New York, thirty-five years ago, who were never willing to pay a cent or lose a meal. The St. Louis association was large and prospering, but they had one serpent in their midst (naming the firm of dealers). There were about eight or ten shops in St. Louis not in the association. Mr. Gallagher recounted the events of the journeymen's strike, which was begun in St. Louis two months ago, and was, he said, still going on. It had made both the masters and journeymen most solid; for both had stood up and fought it out, and were still fighting. (Before the convention closed a dispatch was received from St. Louis declaring that the strike had been ended.)

For New Jersey, Mr. Zumbusch reported the Jersey City association to be in good condition. They wanted to secure the appointment of one or more plumbers as sanitary inspectors. Newark and Orange had organized master plumbers' associations.

Mr. John Mitchell, State Vice-President for New York, reported that he had not been able to secure the formation of any new associations. Those of New York City and Brooklyn were prosperous. In that of New York he thought rivalries were disappearing, and there was an increase of brotherly feeling, and a closer union for mutual protection. The association was loyal to the national body. He related the disturbed condition of the trade, due to fears of a strike by the journeymen, and touched on the relations of journeymen and apprentices. With reference to the Baltimore Resolutions, New York favored home rule. The association had tried the strict policy under the Resolutions for two years, and it had been found wanting. They felt that some policy better suited to their conditions should be adopted.

For Ohio, Mr. E. A. Futerer, of Columbus, reported good progress among the local associations. All the large cities now have them, Dayton and Toledo having recently organized. Their efforts had developed a sentiment in favor of better plumbing. The abolition of the sub-contract system was agitated. Some business houses still sold goods to people outside the trade. He believed general boycotting the only remedy. Ohio boasted one of the most efficient State associations in the country. He regretted that the plumbers had not secured a representative on the new Ohio State Board of Health, and thought its efficiency impaired by that omission.

Pennsylvania, by its Vice-President, J. P. Reinecke, of Pittsburgh, reported that during the year no new associations had been formed. He had, however, extensively corresponded to that end. The Pittsburgh association was prosperous, and was trying to have the State Plumbing Law amended so as to include Pittsburgh. The Philadelphia association was in a very flourishing condition, a proof of which was the trades-schools. The manufacturers and dealers had lived up to the Baltimore Resolutions; there had been no complaints in this respect.

Mr. Harkness, of Philadelphia, following, explained to the convention the operation of the Philadelphia plumbing ordinance, and stated that 450 plumbers were already registered under it. One branch of the City Council has passed the order for the necessary appropriations under the law, and the other would do so.

For Rhode Island, Mr. Thomas Phillips, of Providence, stated that the year had been marked by no notable events, either of loss or gain. Things were in *statu quo*. The strikes had not appeared except in one instance, and that had been compromised by an Arbitration Committee. Their system of trade protection was operated in the spirit of the Baltimore Resolutions. It was as well safe-guarded as their circumstances admitted of. The Providence Aldermen had appointed a committee to formulate a plumbing ordinance. It had been formulated, but remained in the committee. He hoped soon to be able to say that Providence has a plumbing law.

For Wisconsin, Mr. W. E. Goodman, of Milwaukee, reported that his city was the only one in the State of sufficient size to form an association. Oshkosh, Eau Claire, and other towns had been invited to join the Milwaukee association. Hoped to see the plumbers increase and obtain strength to form associations.

It may be stated here that for various reasons several of the States represented were unable to present their reports. That of Massachusetts was not now read because through some delay on the railroad the baggage of Mr. Isaac Riley, State Vice-President, containing the report, did not reach Deer Park in time.

On the call for reports of standing committees, which followed the reports of vice-presidents, that of the Auditing Committee not being ready was deferred. It was pre-

sented on the following day, certifying in the usual form to the correctness of the accounts.

The Sanitary Committee had nothing to report. The Legislative Committee, Hannan, of Washington, Chairman, had had nothing brought before it which required its attention.

The Apprenticeship Committee, Harkness, of Philadelphia, Chairman, deferred its report until later in the session. It was presented on the following day, and proved to be of much interest. We give it here, in abstract, to preserve the continuity of our report. After reciting the urgency of immediate action by the National Association, the committee recommends:

- (1) That every apprentice should be of good moral character, and of sufficient physical and mental ability.
- (2) That no apprentice should be taken for less than five years.
- (3) That the right of an apprentice to leave his employer shall not be recognized, except upon a mutual agreement in writing signed by the employer and guardian.
- (4) Every master plumber taking an apprentice should feel legally and morally bound to teach or cause the apprentice to be taught the trade.
- (5) If a master plumber is obliged to discharge an apprentice because he has not work for him, it should be his duty to find him employment with another master who will give him work and teach him.
- (6) Questions of wages, etc., should be left to local associations.
- (7) Recommending the system now in use in Chicago.

The report of the Essay Committee stated that no better means existed for accomplishing the aims of the National Association than the reading of essays. Thus they did their part to secure equal advancement of the trade in all parts of the country.

The Conference Committee, McCoach, of Philadelphia, Chairman, reported that a letter had been received in regard to the troubles between masters and journeymen in Milwaukee. The committee had made an investigation, and come to the opinion that as the journeymen plumbers had opened shops and were conducting a plumbing business they had placed themselves in the position of master plumbers, and were entitled to all the rights and privileges of such. Accordingly the committee begged to be discharged from further consideration of the matter.

Immediately after the report of the Essay Committee, Mr. Birkett, of Brooklyn, had moved that when the convention adjourns it adjourns to meet at 8 P. M., to take up the essays. The motion was carried, after the amusing debate that has attended every attempt to have the essays read *in extenso* in the conventions. It ran along with its usual ardent defence of the essays, and ironical references to their profit, Mr. Cummings, of Brooklyn, remarking that he had come to attend a convention, not a trade-school, and Mr. U. D. Theobald, of Canton, O., entertaining the convention, in defence of the essays, by an impassioned statement of the claims of the young men to consideration over their elders. The debate ran its course, and the convention adjourned after listening to the president's address.

The presidential address now presented by the retiring president, Mr. James Allison, of Cincinnati, had evidently been prepared with great care. In style it was carefully finished, and in dealing with some vexed questions, particularly with the option to be allowed local associations in their interpretation of the National Association's policy with reference to "trade protection," it held a moderate and conservative tone. The address was received with much applause. Its principal points are here abstracted:

"It is a time-honored custom that when those entrusted with public duties come to return the insignia of authority to those that gave them, they render some account of their stewardship, and report such details of good or ill fortune as may be of interest to those they may have represented. Concerning the manner in which my trust has been performed, I can only say that amid elements more or less inharmonious I have sought to execute the expressed will of the association in my official capacity, as distinct from and unbiased by my own personal views and opinions as possible. It is with feelings of satisfaction, therefore, that I am able to report that the outlook of the year's progress is anything but discouraging. The world is beginning to realize its indebtedness to the plumber as the executive of sanitary science for its immunity from the devastating pestilences of the past; the absolute necessity of correct plumbing, drainage, and ventilation is recognized. They begin also to understand that it is with the object of enabling the art of practical sanitation to keep up with the advance of sanitary science that we have organized national and local associations of plumbers throughout the world. The best testimony we can offer to the excellence and usefulness of our work, and the good faith and earnestness of our effort, is the annual gathering of the best intelligence of our guild from all quarters of the country in order to compare experiences and devise methods of advancement. Already plumbers are realizing the character and dignity of their responsibilities. Trade schools for training young plumbers are gradually springing up. The public has been aroused from its apathy; higher grade of work has come to be appreciated, and for sanitary reasons the necessity for legislation and education is more and more appreciated. States have fallen into the procession of progress and all

have organized boards of health. Minnesota leads off with a State association of master plumbers, and Illinois will soon follow, as examples to the rest, so that localities where the number of plumbers do not warrant associations may still have their representative organizations. Local associations have been formed everywhere, and, inspired by a lively interest in the cause, are unanimously calling aloud for legislation. A thousand sanitary wants are annually met by as many inventions whereby our art is simplified and its benefits extended. The laws of health and disease are becoming daily better understood. Sanitary science, the most human and humane of all the achievements of modern civilization, is becoming more and more correctly applied to the amelioration of human ills every year. This is what the plumbers have been doing, and it is but the beginning of the end of what we intend to accomplish so soon as we are able to rise above the little dissensions incident to local differences of interest or opinions, and direct our combined efforts toward the higher and more worthy aims of the National Association. Against such a broad ambition to advance our art to the dignity of a profession and to meet the growing necessities of the age, degrading discussions over mere local interests become of but small consequence.

They possess scarcely influence to produce serious misunderstanding, still less the broad demoralization which some have affected to fear may overtake and wreck the enterprise. Year by year our meetings have grown more cordial, fraternal, and enthusiastic. Year by year the community have come to recognize the value of our efforts to improve sanitation by the process of rendering ourselves more worthy of the demands of increasing population and advancing science, and in these efforts we have been consistent, honest, and successful. I say successful, because since the inauguration of this movement we have continued to advance gradually but surely. We have not secured *all* we ask, perhaps, in any direction, but are ever gaining a little at a time. And thus far the mistakes which have contributed to hinder our advance have not been of our making. There are some points which I regard as essential to our success which cannot be too frequently repeated or too fully discussed. One is the policy of urging, early and late, in season and out of season, the importance of State legislation in order to establish a just and absolute standard whereby the relations between the plumber and the public may be adjusted. Without such a standard our contest with caprice and ignorance is discouraging and arduous. Trade schools, wherever established properly, have fulfilled the expectations of their founders. No factor, in determining the usefulness and value of a young plumber's career, can at all compare with his education in the scientific and practical element which these schools should furnish. And the grades of acquirement and skill from apprentice to master plumber should be distinguished by such marks of honor as to render them worthy objects of ambition and attainment, and the qualifications requisite to obtaining certificates of grades should be plainly set forth and firmly enforced. As regards the essay feature of our association, the method has always received my cordial approbation as the most efficient means of bringing forward subjects worthy of discussion, our only means of reaching and educating the public, which is not in the least degree interested in our business minutes or trade squabbles. Another matter should, if possible, be seriously discussed and disposed of. I mean in regard to some uniform adjustment of the relations between master and apprentice. As the apprentice of to-day is the father of the practical plumber of the future, all 'ways that are dark and tricks that are mean' should be peremptorily omitted in the education of the coming man to whom the sanitary welfare of the world is presently to be entrusted. The intricate and puzzling questions which ever exist between master plumbers and journeymen should, I think, elicit your serious attention also. Before closing, perhaps, a few words in regard to that still unsettled question and prolific source of disquiet—involved in the Baltimore Resolutions—may be not only appropriate but necessary. The duties and powers of the National Association, like that of the general government, are exercised for the public welfare, and in order, therefore, to secure a just administration of such powers, local needs, customs, and interests must be duly considered, proper concessions made in particular cases, the general object being the common welfare, yet kind to the peculiar necessities of *each*. However correct in principles and pure in aims any special policy may be, it is not always expedient and perhaps seldom just to ignore what may be regarded in special cases as private rights, in order to secure the public weal. The Baltimore Resolutions are our creatures, not our masters, and the plain, common-sense course to be pursued in regard to them is—instead of wrangling over our opinions—to review our experience calmly and dispassionately, weigh the good and evil carefully, and not forget that exact justice to one is not to be secured at the cost of injustice to another. In my official capacity I have had opportunities for learning the views of the craft from all quarters, and I have carefully refrained from interposing my private interpretation upon the plain, simple letter of the law. My conclusions are that a large proportion of American plumbers regard the method of protection announced by the Baltimore Resolutions as quite a matter of course, and are unable to comprehend the excited feeling manifested by the opposition. Most of them consider the objects sought to be obtained as not among the highest or most desirable aim of the association, and would assent to any arrangement whereby the irritating hindrance to more useful work might be removed. The chief objections have been on the grounds of expediency, based upon a supposed injustice to certain localities which would follow this enforcement. But I have yet to hear one valid objection to the correctness of

the principle involved in the Resolutions. The general tone of opinion throughout the country appears to favor a thorough and final adjustment of the matter in some manner. If, in the judgment of the association, our experience warrants their continuance in the present simplicity and clearness of intention; or, if careful revision of the field should demonstrate that a due respect for existing conditions renders such a modification desirable as may allay irritation, and while holding to the integrity of the principle, may leave the details to the local associations; or in case the combined wisdom and experience of the association should decide that the time is unpropitious or premature for the enforcement of a principle to the justice of which no one seems to dissent, and repeals the Resolutions altogether, why, so mote it be. The work we are doing is far too important to be delayed."

The evening session was devoted to the reading of the essays prepared by the local associations under the assignment of subjects which has already been published in THE SANITARY ENGINEER. Summaries of these will be published in later issues. There were present many ladies, relatives of delegates, and the hotel band in an adjoining room entertained the audience at intervals between the reading of the essays.

After the reading of the essay by the Philadelphia association, it was announced that the chairman of the first convention, in New York, in 1883, Major W. E. Forster, of Norfolk, Va., was present. Loud applause followed, and Major Forster was brought to the platform and presented. He spoke briefly of his satisfaction at being present, saying, "he came because he could not help it. He could not stay away."

After the reading of a number of essays, the convention adjourned its formal session until Wednesday, at 10 A. M., and then entered into a less formal procedure of dancing, in which the ladies took active part.

WEDNESDAY, JUNE 23.

On the assembling of the convention at 10:20 A. M., the essays not read on the previous evening were received and ordered printed. Then, resuming the reading of reports of State Vice-Presidents, Mr. Tute read that of Mr. Isaac Riley, of Boston, State Vice-President for Massachusetts, which stated that efforts had been made, both by correspondence and in person, to organize master plumbers' associations throughout the State. These not meeting with much success, the efforts of the vice-president had then been directed to affiliating the master plumbers in the vicinity of Boston with the association, and gratifying results had followed, the membership increasing 50 per cent. As to trade protection, they are working under their local agreement, which had been beneficial, and he would view with alarm any legislation of the National Association which would interfere with the local agreement.

Minnesota presented no report.

A communication from the hotel manager relating to the banquet was read, and then was presented the report of the Special Committee on the recommendations made by the Executive Committee the previous day.

It was generally said that if there was any "fun" in the convention it would now be apparent, for it was well understood that the different views as to the method of trade protection and of applying the Baltimore Resolutions would be argued out, and the matter settled over this report.

It may be said, summarily, that they were argued out, and that the convention adopted, by a vote of 100 to 33, the views of the Executive Committee, and the majority of the Special Committee, giving discretion to each association in the matter of making terms with the manufacturers and dealers in plumbing materials.

The Special Committee's report was in substance the following:

(1) They recommended for adoption the suggestion of the Executive Committee that a majority of that committee should reside in the same city, or be located within convenient distance of each other, only substituting the words, "be located as near as possible to each other," for "in the same city," and following words of the original report, the effect being, of course, the same. Adopted by the convention.

(2) They recommended that \$750 be placed subject to the order of the president or secretary, for clerk hire, in place of the \$500 recommended by the Executive Committee. Adopted by the convention.

(3) They approved the recommendation that the plumber should cease acting as agent, and strive to become a merchant.

After some debate in the convention, Mr. McNeil proposed, to meet several amendments to the wording, that the last clause of this recommendation (as given in our notice of the Executive Committee's report in Tuesday's proceedings) be stricken out, and the words substituted, "in order that the plumber may be better protected." This suggestion was adopted by the convention, and the recommendation takes substantially this form:

"That the plumber should cease acting as agent, and endeavor to buy goods in quantity, and become a merchant, in order that he (the plumber) may be better protected."

(4) The recommendation of the Executive Committee, that discretion be allowed local associations in arranging terms with dealers, was approved of, the Special Committee saying in substance that in localities where experience has proved that members of the association cannot live up to the strict interpretation of the Baltimore Resolutions, the local associations should be allowed discretion in making arrangements with dealers, provided such arrangements are sanctioned by the Executive Committee.

We have noted that the first three recommendations were adopted by the convention without debate. When the fourth was read, Mr. Macdonald, of New York, Chairman of the Special Committee, stated that this embodied the views of the majority of the committee. A minority report would be presented by Mr. J. J. Wade, of Chicago.

Mr. Wade objected to the recommendation allowing local associations discretionary powers, subject to the consent of the Executive Committee, on the ground that only the National Association in its corporate assembly was competent to make any alteration of policy in this matter. In other words, as we understand him, no policy adopted by a local association could be regarded as having any binding force, unless that were approved by the whole body of the National Association in convention. He further objected that the change would be for the benefit of the dealers, and was favored by them.

Mr. Hudson, of Brooklyn, moved the adoption of the majority report on this recommendation, and a general debate began. It had its humorous phases. Wilson, of Baltimore, brought down the house by the candid way in which he set forth the difficulties the plumber had labored under to get the dealer to keep faith, and again laughter rang out more than once when several speakers reported a like melancholy experience. Now and then the opposing interests of different localities led to insinuations, which brought out speakers from the accused region in defence. So it went, in the main in good temper, and frequently with a great deal of force, resulting in as full a statement of the position of the plumber between the dealer and the architect and consumer as has been made in any of the conventions. The Eastern men appeared to have gone to Deer Park ready for a general debate on the policy of a "cast-iron" enforcement of the Baltimore Resolutions. The Western view was maintained chiefly by Andrew Young and J. J. Wade, of Chicago, with support by several others, as our report shows.

We abstract the debate:

Andrew Young, of Chicago: The adoption of the majority report condemns the protective policy of the National association from the day of its existence. Protection was promised in New York at the first meeting, signed by all the leading plumbers. Who want to retrograde? New York, Brooklyn, Philadelphia, and Boston—men who have never obeyed the law you have made. Boston says she is proceeding under an agreement made before the adoption of the Resolutions. The Baltimore Resolutions are not responsible for the want of protection, but the National Association's lack of courage to make manufacturers yield their rights is. They (the dissenting delegations) say they have a better policy—some sugar-coated pill to offer. He wanted to hear the arguments of every man who wanted to go backward—the reasons of those who have never kept the Resolutions, particularly the reasons of New York. Chicago and the West want to hear them, to know if this gilded pill is acceptable even to the manufacturers who have said they were satisfied with the Resolutions.

Mr. Mitchell, of New York, rose to defend New York and himself. He was a strong advocate of protection and of any means to secure it; New York lacks no courage which Chicago possesses; is as zealous for the National Association; as willing to make sacrifices. She only asks that all be protected alike. The interest of Chicago and New York are totally different on this question. The iron-clad policy so favored here to thrust upon them cannot be carried out in New York. New York asks from the extreme gentlemen some measure to relieve them from the consequences they present. A time may come when New York will be as able and zealous as Chicago to strictly carry out the Baltimore Resolutions, but not yet. They lack the force and numbers to carry them out. They desire to increase in numbers, to grow in strength, and for this they ask to have the modification made. The Resolutions are signed only to be broken. He was sorry for Chicago. A man is among them to-day carrying on a large business—a man opposed to them. They are buying his specialties to-day and putting them in. Go on with the Baltimore Resolutions where they suit, but let New York and Boston have discretionary powers. The Resolutions were an innovation. All were then anxious for protection, and they clung to anything that seemed to offer it. But two years have demonstrated that they cannot be carried out. Give them time in New York and they may be able to carry them out. The men outside their local organization are the better protected to-day. They appeal to the dealers, who are outside the Resolutions, and the dealers support them. Any one who leaves the association for any reason gets the support of dealers who oppose the Resolutions. New York has done everything she is not able to sustain the Resolutions. He appealed to the

National Association to give those sections where they are in disorder their fostering care. The National Association was intended to govern all, and protect the weak as well as the strong.

Mr. Griffith, of Chicago: Holding the Baltimore Resolutions as a banner before them had done them more good than anything else. Wants all to rejoice with Chicago. Mr. Griffith compared the passage of the Baltimore Resolutions to the signing of the Declaration of Independence.

Such a remark required Bunker Hill to be heard from, and Mr. Davlin, of Boston, rose.

Mr. Davlin reminded the preceding speaker that the Declaration of Independence grew out of the attempt to enforce oppressive laws. For himself, he had not been cognizant of the passage of the Baltimore Resolutions at the time, although he had attended all the conventions. Have they been successful? Collectively they were told Yes; individually, No. An obsolete law is a drag. They want the simplest laws, and want to make the fewest demands possible on the material men. Laws adequate to the needs of the West are inadequate to the needs of the East. The West wants to force the Resolutions on them in the face of their protest. It cannot be done. What fraternity is there in that? If the case were reversed he would say, alter it so that the West can come in with the East. From differences between different parts of the country you can't pass any measure which will suit all sections. Boston has not been working under the Baltimore Resolutions, but the goods of one firm which did not observe them were tabooed in Boston. If any firm treads on the toes of Chicago, notify Boston, and Boston will raise a Paul Revere for the occasion. Boston retains the privilege of local self-government. He fails to see why there should be any objection to the recommendation of the Special Committee. It gives to the West opportunity to enforce their view, and to the East opportunity to enforce theirs. (Here followed an exposition of the relations existing in Boston between plumbers and material men.) New England comprises many small towns and cities, many of these containing small factories. Their inhabitants are the employees. By thrift seven-tenths of the workmen have come to own their own homes, and these little communities want all improvements, water-works and gas-works. The towns are too small, however, to support a plumber. When one has a new plumbing job to be done he buys his materials in Boston and has them put up. Before the present agreement the only remedy of the Boston plumber was to refuse to put up the goods, and a hardware man or a harness-maker in the town would put them up. Now the Boston plumber gets a certain discount on every bill of goods. Before this measure went into effect the buyer could get goods as cheap as the plumber; now he cannot. The legitimate sphere of the National Association is to leave the local association untrammelled in its agreements, and then use all the power of the National Association to enforce them. The East would dislike to have legislation here which would affect the standing of the National Association at home.

Mr. Gallagher, of St. Louis: The Baltimore Resolutions were sprung on the convention at a late hour and hurried through without much thought. It might be that there was something in the Baltimore Resolutions which did not suit all sections. He wanted a committee appointed to revise them. Some points in them were of no interest in St. Louis. Let the National Association be very careful in selecting its head man, he to be very careful to put proper men on his staff, then he (Mr. Gallagher) would let them act favorably or adversely on the application of any locality in this matter. He would not let a locality act on its own responsibility without such application.

Mr. Trainor, of Baltimore, did not want to let the grievance wait if it existed. Extend a remedy if it exists. He had never been informed of any violation, but in some localities the Resolutions seem to be a failure, but they cannot consent to admit they are until they know the remedies at hand have been used. Let those localities say what they need. They certainly know what they want. He wants to know what they propose. If the Baltimore Resolutions cannot be enforced he was willing to accept any substitute which would not interfere with his locality.

Mr. Gabay, of New York: Let the Baltimore Resolutions stand. They suit the West. The protection New York, Philadelphia, and some other cities need they thought they would get, but they have tried the Resolutions. Some firms signed them two years ago, and some of these broke them. Some other firms would not sign them, and when the first-named firms found this out they dropped them too and went on in the old rut. Should not New York have rights the National Association is bound to protect? The National Association is undertaking to suppress New York. Some New York firms do protect the plumber in Chicago and the West, but not in New York. New York wants some amendment made under the Resolutions which will allow them to get protection. The West can intrust its interests to the Executive Committee if the East is willing to.

Mr. Semple, of Cincinnati: The National Association should stand on the platform of the Baltimore Resolutions. The men in New York may not be able to enforce them. They will lend a hand to help them up; they do not propose to let the East drag them down. Let the East give to them specifically what is wrong in the Baltimore Resolutions.

Mr. Finnerty, of Boston: It is absurd to say men who do not control four per cent. of the building trade should control the business. Men in Boston who manufacture and will not sign sell their goods right in Chicago and Cincinnati. All the protection they require is to get their legitimate profit. Any citizen has a right to buy any

goods. The plumber only wants his legitimate profit on his business.

Mr. Macdonald, of New York, Chairman of the Special Committee, had hoped for a unanimous vote for the recommendation. New York needed a change. For two years New York had tried to sustain the Resolutions. They now ask for a small concession. They do not present a definite proposition, because they do not yet feel they can get it. If they fail to get what they want to-day, they will try it again next year, and so on. New York has 650 master plumbers. The Master Plumbers' Association has paid to the National Association the dues of 225. She wants the means to bring in the other 425 men to unite with them. There were men in the convention who had sacrificed thousands of dollars rather than put in certain specified goods. What materials does the West ship to the East? All articles used in the East are manufactured at their doors. Western firms can easily be induced to sign the Resolutions, because they have no export trade. (This last argument was several times vigorously combated in the course of the debate, and several Western firms were cited, for whom the claim was made that their goods went all over the country.)

Here a proposition to adjourn was roared down, and the debate continued.

Mr. Young, of Chicago, then proposed that they adjourn until 2 P. M., to allow the opposition to the Baltimore Resolutions to prepare their views for a formal presentation to the convention. But the proposition did not secure support.

Mr. Hannan, of Washington, wanted to give freedom to the East to make their local agreements. One of two dealers who refuse to sign you cannot make sign. He sells his goods all over the country; but he will give a percentage to the plumber. For himself, he would tell any one he would not put in any material he did not buy. There were other matters besides the Baltimore Resolutions at stake in Washington. Other plumbers might join you on those, but not on this issue.

Mr. Wilson, of Baltimore, described how they had fared under the Resolutions. The material men, he said, had formerly robbed the plumbers of their birthright, and the plumbers had been only boss journeymen. The material men had not been satisfied with their legitimate gains. Then one manufacturer had come to them, who wanted to break up middlemen. He wanted to sell only to plumbers. But d—n it, he wasn't satisfied with selling to plumbers; he reached right out and sold to consumers. After the Baltimore Resolutions were signed firms stopped selling right over their heads. If you exempt one association here, and another association there, what will the dealers in Baltimore say: "Are you men of Baltimore wiser than they?" Then they will go on and break the Resolutions again and rob the plumber of his birthright. He hoped the gentlemen who wanted an exemption from the Resolutions would not leave Baltimore in the lurch.

Mr. Byrns, of New York, hoped the suggestion of Chicago, that the opposition compare notes before 2 P. M., would not prevail. It couldn't be done. He favored the recommendation of the Special Committee. He had confidence in the Executive Committee—in any committee presided over by the president. Are the gentlemen of the West afraid of New York? New York simply wants home rule—what the Executive Committee will grant. They will have no power, except under the committee. The Baltimore Resolutions have been tried and found impracticable.

Mr. Birkett, of Brooklyn, did not see that they were asking anything which had not been granted to Chicago and other associations. At Baltimore the Resolutions were referred to the Executive Committee with a Chicago president. At St. Louis they were referred to the Executive Committee, with Mr. Allison, of Cincinnati, at the head. Now they ask that the Resolutions may be left with the incoming Executive Committee.

Here calls were made for the question, and there was considerable confusion. One member moved the previous question, and others called for adjournment. Finally, the president put the motion on adjournment, which was lost, as a majority were clearly anxious for a vote, if possible, before the recess.

The debate continued a short time longer, with remarks by Mr. Boyd, of Chicago; Mr. Reynolds, of New York; Major Foster, of Norfolk; and Mr. Whitelaw, of New York. Major Foster warned the association to give some latitude to the local bodies in this matter, lest they provoke dissension and secession from the association. He desired an adjournment and time given to the opposition to formulate their views. Mr. Whitelaw opposed adjournment, and again stated the impossibility of the New York members enforcing the Resolutions in the presence of the great majority of master plumbers not in the association. He thought it impossible to compare the situation in small towns with one or two plumbers with that in New York, where there were 163 firms selling materials to plumbers. In his opinion they needed to go back twenty-five years and buy directly from the manufacturer, and not from middlemen, whose commission was made out of the plumber.

A motion was now put and carried to adjourn until 2:30 P. M., with the understanding that a vote would then be taken.

On reassembling after the recess it was the general opinion that the fight had gone in favor of the committee's recommendation, but it was continued a little while.

A call of the roll was had immediately, and it was found that the convention was entitled to 139 votes. Then Mr. Moylan, of Chicago, continued the debate.

Mr. Moylan had always regarded the resolutions as a move in the right direction. He thought it strange to hear New York say they were trying to do more than sister associations were doing. Chicago had made great strides under the Resolutions. They had made merchants of the plumbers. You can go from shop to shop in Chicago and see nearly all virtually supply-houses. He thought (in reply to a remark made by Mr. Whitelaw in the morning) it was never intended that a plumber should refuse to figure on goods specified. Their friends in Boston seemed to be satisfied with what they had got. They did not say that even the spirit of the Resolutions suited them.

Mr. Worthington, of Philadelphia, urged the convention to weigh carefully what they were doing. The National Association could not settle the matter for the local associations. If the National Association should make an edict binding local associations to their injury, interfering with local associations, he would ask the Philadelphia association to dissolve its connection with the National Association.

Mr. Young, of Chicago, did not want it understood that the West stood in the way of anything to the advantage of the East. But he feared that the entering wedge would work to destroy them of the West. The Boston plan left the plumber a go-between, a runner or steerer for the dealer. He firmly believed the consumer belonged to the plumber, who (and not the dealer) was held responsible for any defects in the goods which he put in. He feared that the convention was going to put in the entering wedge in the interest of the manufacturer, and would do those who had protection an injury.

In response to questions from Mr. Wade, of Chicago, and others, Mr. Davlin, of Boston, again explained the plan in Boston, and took occasion to reply to insinuations that that plan was dishonorable and would not bear the light of day.

Mr. Wade, of Chicago, pointed out the improvement which had been made under the Resolutions. He feared the action likely to be taken was going right back to the condition of things before the Resolutions were adopted. It would bring the boy who was able to make a cup-joint into competition with the master plumber, also the unworthy journeyman who would be able to get the materials and put them in. They would be doing great injustice to the plumber, and also to the consumer, who had a vital interest in good workmanship.

The question was called for.

Mr. Hussey, of Boston, defended Boston, and Mr. Low, of New York, called for harmony.

Then the recommendation of the Special Committee was read again, and the vote taken.

The chairman of each delegation announced the vote of his delegation, polled by heads, and the tally was as follows:

In favor of the recommendation allowing discretion to local associations:

Baltimore, 1; Boston, 10; Brooklyn, 13; Canton, O., 1; Cincinnati, 3; Columbus, O., 1; Hampden County, Mass., 1; Hudson County, N. J., 3; Indianapolis, 1; Kansas City, Mo., 2; Kansas State, 2; Pittsburg, Pa., 5; Providence, R. I., 4; St. Louis, 8; Washington, D. C., 2; Wheeling, W. Va., 1; New York, 23; Norfolk, Va., 1; Milwaukee, 1; Louisville, Ky., 3; Philadelphia, 9; Minneapolis, 3; New Haven, Conn., 2.—Total, 100.

Against the recommendation:

Alton, Ill., 1; Baltimore, 6; Chicago, 18; Cincinnati, 3; Kansas State, 1; Washington, D. C., 1; Chicago Officers, 3.—Total 33.

So the recommendation was carried.

The splits were in the delegations of Baltimore, Cincinnati, Kansas State, and Washington. The vote of St. Louis in favor created a sensation, and the votes of Boston, Brooklyn, Chicago, Philadelphia, and New York, plumping large figures in either column, were greeted with applause.

Then the report of the Executive Committee (as a whole, with the interpretations and recommendations of the Special Committee) was adopted.

Now followed the report of the Apprenticeship Committee, abstracted above.

The President read a telegram from Washington, signed by Daniel Lamont, Private Secretary, declining with thanks an invitation to the President of the United States to be present during the convention.

A communication was read from the Detroit association giving reasons why they were unable to attend the convention.

Also a letter from J. T. Holmes, State Vice-President of Minnesota, saying they were unable to be present on account of the strike of the journeymen.

Mr. Young, of Chicago, moved the adoption of the resolution presented at St. Louis last year by New York, which declares the intention of the association to maintain the policy of protection thus far carried out, from pages 117 and 103 of the printed report of proceedings. The motion was seconded by a member from New York and carried.

A motion of Mr. Tute, of Boston, to strike out from the record the count of the vote on the recommendations and declare it unanimous, was declared out of order.

Then the completed report of Mortimer Lyons, Treasurer, was presented, showing:

Receipts	\$2,383.58
Expenditures	1,595.44
Balance	\$788.14

At the beginning of the year there was an indebtedness

of \$763.95, which the balance would clear and leave a net balance of \$24.19.

The report was sent to the Auditing Committee, and thanks were tendered the treasurer.

The election of officers now taken up, went in quite a different way from the preceding conventions. Apparently of the opinion that it was wise to let well enough alone, the convention again selected the same gentlemen as last year, with the exception of the First Vice-Presidency, and without contests. Tellers Harkness, Trainor, and Schulafer were appointed, and on motion of Davlin, of Boston, the Secretary was instructed to cast one ballot for the convention in favor of James Allison, the present incumbent, for the office of President. This was done, and Mr. Allison declared elected amid great applause.

For the First Vice-Presidency three candidates were nominated: James W. Birkett, of Brooklyn; John Trainor, of Baltimore; and J. P. Gallagher, of St. Louis.

On the first ballot Birkett received 61 votes; Trainor, 56; and Gallagher, 16. Necessary to a choice, 67; no election.

On the second ballot, voting confined to the leading candidates, Trainor received 60 votes and Birkett 65. Necessary to choice, 68; Trainor elected.

For Recording Secretary a wish was expressed that President Allison have the selection. He indicated Thomas McNeil, of Cincinnati, present incumbent, and the choice was ratified by the convention.

For Treasurer, the convention instructed Mr. Davlin to cast a single ballot for Mortimer J. Lyons, of Brooklyn, present incumbent, and he was accordingly elected.

For Corresponding Secretary, the convention instructed Mr. Trainor to cast one ballot for James Semple, of Cincinnati, who was accordingly elected. He is the present Corresponding Secretary.

The office of Financial Secretary went without question to Enoch Remick, of Philadelphia, who has held it during the life of the association.

The office of Sergeant-at-Arms was given unanimously to David J. Collins, of St. Louis.

On motion of Boyd, of Chicago, the appointment of the Executive Committee was left with the officers-elect. Then followed the appointment by the delegations of the State Vice-Presidents as given below.

The officers-elect for the year 1886-7 accordingly are:
 President—James Allison, of Cincinnati.
 First Vice-President—John Trainor, of Baltimore.
 Recording Secretary—Thomas McNeil, of Cincinnati.
 Treasurer—Mortimer J. Lyons, of Brooklyn.
 Corresponding Secretary—James Semple, of Cincinnati.
 Financial Secretary—Enoch Remick, of Philadelphia.
 Executive Committee—George R. Phillips, of Rhode Island; J. W. Birkett, of Brooklyn; T. C. Boyd, of Chicago; J. A. Macdonald, of New York; J. J. Weaver, of Philadelphia; and the President, First Vice-President, Recording Secretary, and Treasurer.

The State Vice-Presidents named by the delegations are for—

Connecticut—Robert Morgan, of New Haven.
 District of Columbia—E. J. Hannan.
 Illinois—P. J. Kane, of Alton.
 Indiana—J. Giles Smith, of Indianapolis.
 Kentucky—W. S. Matlack.
 Kansas—G. W. Kite.
 Maryland—T. J. Griffith.
 Massachusetts—D. G. Finnerty.
 Michigan—J. Meathe, of Detroit.
 Minnesota—E. C. Cauvette, of Minneapolis.
 Missouri—W. Norris, of St. Louis.
 New Jersey—J. F. Blackshaw, of Jersey City.
 New York—George Cummings, of Brooklyn.
 Ohio—W. Ricketts, of Cincinnati.
 Pennsylvania—J. P. Reinecke, of Pittsburg.
 Rhode Island—P. Tierney.
 Wisconsin—W. E. Goodman, of Milwaukee.
 Virginia—W. E. Foster, of Norfolk.
 The Sergeant-at-Arms will be David J. Collins, of St. Louis, who filled that office in 1884-5.

The selection of the Auditing Committee is left with the officers-elect.

The decision of the question whether officers who may be present at a convention in their official capacity simply, without having also been elected delegates, shall have the right to vote, eligibility to office, and all the privileges of members of delegations is left to the incoming Executive Committee, which is instructed to inform the local associations of their decision. The point was raised by Macdonald, of New York, that unless elected delegates their official capacity *per se* did not, under the constitution, give them the privileges of delegates to the convention. The Executive Committee will pass upon the whole question of what constitutes membership under articles 4 and 5 of the constitution.

A telegram from St. Louis, declaring the strike off, was read amid applause.

From the Milwaukee Association a long communication was read, complaining that the committee to which was referred the matter of the strike in Milwaukee in 1885, and the prospective starting of co-operative shops, had done nothing. As this was the matter reported on by the committee on Tuesday, explanations were made which led Milwaukee to withdraw the implication of neglect, and the communication so amended will be spread upon the minutes.

The fixing of the per capita tax is left with the Executive Committee. For 1885-1886 it has been \$2.

The invitation to hold the next convention in Chicago was accepted. There it will be.

Certificates of membership will be signed, stamped with the official seal, and sent to the local associations.

The Executive Officers and the State Vice-Presidents will, if possible, obtain from the National Government and from the several States legislation to further sanitation.

The president announced, before adjournment, the Executive Committee as herein printed in the list of officers.

The thanks of the convention were given to the retiring First Vice-President, George R. Phillips, of Providence; to the retiring officers; to the Committees on Transportation and Arrangements, and to the press, and then the convention adjourned *sine die*.

On Wednesday evening a banquet was given in the hotel, and on Thursday excursions were made under the direction of Mr. Charles McKenzie, of the Baltimore and Ohio Railroad.

Correspondence.

AMOUNT OF STEAM-PIPE FOR GIVEN RADIATOR-SURFACE.

13 IRONMARKET, NEWCASTLE, }
STAFFS, June 8, 1886. }

SIR: As a constant reader of your paper, from which I have at times derived a deal of information, I should be pleased if you would give me information upon the following matter.

Have a building to heat with the low-pressure hot-water apparatus, containing about 500 superficial feet radiating surface, the heat to be generated by steam at about fifteen pounds pressure passing through pipes in a closed cylinder or heater, the same being filled with water from which there will be a flow and return pipe, same as a low-pressure circulating boiler. How many feet superficial of steam-pipe shall I require in the heater to generate the heat required for the 500 square feet of radiating surface in building to maintain a mean temperature of 150° in the radiating-pipes?

Yours truly, C. B.

[Presumably, 1.71 heat-units per hour per square foot of pipe surface for each degree Fahrenheit of difference between the temperature of the pipe and the air of the room to be kept warm represents the greatest average efficiency in the transmission of heat from water-pipes. At this rate, on the assumption you are to keep the temperature of the room or house at 60° Fah., you will have $500 \times 1.71 \times 90 = 76,950$ H. U.]

This is equivalent to the condensation of 82 pounds weight of steam to water at the same temperature (250° Fah.), or what will take place in a closed circuit, or 70.4 pounds weight of steam, if the steam is to be cooled to water at 150° Fah. (the temperature of the tank or closed cylinder). Presumably, 75 pounds weight of steam is a fair assumption of what will have to be condensed in the cylinder to maintain the heat, when once the water is warmed. There is no very reliable data as yet on the amount of steam surface within a tank to any specific duty, but Mr. William J. Baldwin, M. E., informs us that one square foot of surface in a large diameter steam-coil (say three inches) is equivalent to the evaporation of two pounds of water per hour in this form, provided the water of condensation is drawn away. According to this it would call for $37\frac{1}{2}$ square feet of surface in a coil. He further explains that apparatus of this kind are generally failures if the steam is used on a closed circuit, as the condensation is so rapid that the pressure within the coil is reduced, and the water of condensation, instead of running off, fills the coil in a short time, and, of course, will not level into the boiler. If an open or trap system is used, on the other hand, a coil of large diameter can be kept hot, and when the water in the cylinder becomes warmed to near the temperature of the steam it regulates itself, even if the coil is larger than actual results might prove necessary, as condensation nearly ceases.]

THE ENFORCEMENT OF THE PLUMBING ORDINANCE IN CLEVELAND, O.

(From a Special Correspondent)

CLEVELAND, June 22, 1886.

IN theory, it has been necessary for applicants for sewer-builders' or plumbers' license to have a certificate from two reputable sewer-builders or plumbers that the applicant was a practical man and fully competent to perform the work for which he wished to procure a license; practically this rule has been a dead letter, as any one who furnished the necessary bonds could procure a license.

Licenses to sewer-builders have been granted by the Board of Improvements, and the plumbers by the Water-Works Trustees.

On June 18 the Board of Improvements appointed an examining board, before whom all applicants for licenses as

plumbers and sewer-builders must appear. The board consists of Superintendent Whitelaw, of the Water-Works Department; City Civil Engineer Force, and Health Officer Ashmun.

The board will report its action on sewer-builders' licenses to the Health Board, and on plumbers' licenses to the Water-Works Trustees.

A new set of rules regulating sewerage and plumbing is now before the City Council, and final action will probably be taken on them at the next meeting. But no matter how good the rules may be, if the police judge before whom violators of the ordinances are brought dismisses the case or administers a fine, and in the same breath remits it as he has frequently done, the ordinances will virtually be rendered inoperative.

To show how defective are the present ordinances, if a licensed plumber does not conform to the ordinances, he is subject to a fine or imprisonment, or both, at the discretion of the court; but an unlicensed plumber or tinner may do the same work without being subject to any penalty. Such has been the ruling of the present police judge.

Gas and Electricity.

Illuminating Power of Gas in New York City.

Week ending	New York Gas-Light Company.	Manhattan Gas-Light Company.	Metropolitan Gas-Light Company.	Mutual Gas-Light Company.	Municipal Gas-Light Company.	Kriegerbocker Gas-Light Company.	Equitable Gas-Light Company.
June 19.....	25.50	20.32	22.10	30.10	29.81	23.00	32.31

E. G. LOVE, Ph.D., Gas Examiner.

BRAY'S ANTI-PULSATOR.

AN apparatus has been invented by Mr. George Bray, gas engineer, Leeds, which will enable gas-engines to be much more extensively used than they are at present. It removes a serious obstacle to their introduction in that it entirely prevents the "jumping" of the gas-lights caused by them, not only in the buildings in which the engines are working, but even beyond. Mr. Bray's patent is called an anti-pulsator, and gas-lights are rendered perfectly steady by its use. It is an "anti-pulsator" and a gas-bag combined. In construction it resembles small circular bellows, one end fixed and the other movable. Inside there is a valve, on one side of which is a long narrow opening or slot. This is so arranged that a comparatively long movement of the valve-slide opens or closes only a small area of the slot which constitutes the inlet for the gas. The valve-slide is attached by a spindle to the movable end of the bellows. When the taps are turned on the gas passes through the slot into the valve-case, and then through the outlet end of the case into the bellows. As the gas enters the bellows, the movable end is pushed outward, and it pulls with it the valve-slide, and thus gradually closes the inlet gas-port. When the engine takes a charge of gas, the pressure of the surrounding atmosphere forces the movable end of the bellows inwards; the valve-slide is thereby pushed back, and the port being gradually opened, the gas begins to flow again into the bellows. The apparatus, thus far described, would not completely stop the "jumping" of lights, because every pulsation of the bellows would move the valve-slide, and by thus allowing more or less gas to enter, would alter the pressures in the pipes and mains. To prevent this the spindle is passed loosely through the valve-slide, and on it are placed two stoppers, one on each side of the slide, and so far apart that the spindle can move backward and forward for some distance without the stoppers touching and thereby moving the slide. By these means the ordinary pulsations of the bellows, following normal charges, do not move the slide, and it is only pushed backward or forward when the engine requires a considerably larger or smaller quantity of gas. Thus the "jumping" of lights resulting from the working of the engines is entirely obviated. The apparatus is so arranged that the gas-inlet into the bellows is completely closed before the bellows are fully distended, consequently whatever may be the pressure in the pipes and mains, the gas in the bellows is maintained at practically atmospheric pressure, and is delivered at that pressure to the engine in unvarying quantities at each charge. The working of the engine is thereby rendered more regular, and a considerable saving of gas is effected. The apparatus can be easily fixed, it occupies less space than the ordinary bag, it has

no delicately constructed levers or valves, and it requires no adjusting or attention. The "anti-pulsator" is not liable to escapes of gas, as the gas in it is maintained, as before mentioned, at practically the pressure of the surrounding atmosphere. The "anti-pulsator" has in several cases been adopted in Leeds with complete success.—*Gas and Water Review*.

THE Washington (D. C.) Gas-Light Co. is undergoing its usual investigation at the hands of the Senate District Committee. The gas supplied by the company is a mixture of coal-gas and water-gas, and is of very good quality, notwithstanding the fact that one member of the committee thought it was "very poor." At one of the hearings a witness testified that the water-gas made in Harrisburg in 1882 cost thirty-two cents per thousand feet in the holder.

THE gas made by the Manhattan Branch of the Consolidated Company, of this city, has of late presented a very noticeable change. There is a bluish appearance of the flame, the illuminating power has suddenly gone from 19 to over 21 candles, and the specific gravity has increased to about .510. The increased candle-power does not look like Cannel coal enriching. Unless we are much mistaken, the Manhattan has at last got one leg on the water-gas side of the fence.

THE Orange (N. J.) Aldermen are struggling with the problem of street-lighting. A proposition has been made to them to furnish 50 electric-lights for the principal thoroughfares, and also "new and improved street-lamps" (naphtha) for other streets now lighted by gas, for \$11,000 per annum, the contract to be for three years. Additional electric-lamps will be furnished for \$150 each per annum.

THE Metropolitan Board of Works of London, in its last annual report, expresses in the following language its satisfaction with the working of the sliding scale as applied to the gas companies: "The arrangement, under which the profits may be divided by gas companies among their shareholders, are made to depend upon the price at which the gas is supplied—an additional $\frac{1}{4}$ per cent. of dividend being allowed for every 1d. per thousand feet by which the price is reduced, and, conversely, the dividend being reduced when the price is increased—is still found to work satisfactorily. Under this arrangement, combined with the other favorable conditions which have attended the business of gas-making in recent years, the price of gas has been lower and the dividends higher than ever before."

THE following is a list of the papers read at the twenty-third annual meeting of the Gas Institute held in London on June 8 to 11: "The Utilization of Residual Products in Gas-Works," by J. T. Lewis, Wellingborough; "Claus's Ammonia Process of Purification," by C. Hunt, Birmingham; "A Recent Experience in Purification by Oxide of Iron," by R. Travers, Cork; "On the Application of Tar and Breeze to Retort-Furnace Firing," by W. R. Jones, Rome; "A New Departure in Water-Heating," by T. Fletcher, Warrington; "The Relative Caloric Values of Tar (with and without steam) and Coke for Retort-Firing," by F. G. Dexter, Wormwood Scrubs; "The Economical Construction of Gas-Holders," by J. Somerville, London; "Are So-Called Elaborate Regenerative Retort Furnaces a Failure?" by R. O. Paterson, Cheltenham. The meeting of 1887 will be held in Glasgow under the presidency of Mr. William Foulis, of that city.

NOTES.

CHIEF ENGINEER CHURCH, of the New York Croton Aqueduct, has advised the contractors that the improvements for ventilating the tunnels must be in by July 15.

THE franchise of the United States Heating and Power Company, of this city, and such pipes as are laid, were knocked down to the highest bidder at public auction last week, for \$4,700.

THE entire edition of the report of the National Board of Health (3,000 copies) is now exhausted, and the demand is so great for it that the House of Representatives has passed a resolution to print 25,000 additional copies, which resolution is now in the hands of the committee in the Senate.

Notes.

For works for which proposals are requested, see also the "Proposal Column," pages 101 and 102.

CONSTRUCTION.

ASHEVILLE, N. C.—The town is now ready to receive bids for laying 20,500 feet of 10-inch cast-iron water-pipe. Further information obtained of Ernest W. Bowditch, C. E., 60 and 62 Devonshire Street, Boston.

RALEIGH, N. C.—In our "Proposal Column" will be found a proposal for the building of water-works, for the renting of a supply of water to the city. Address G. E. Leach, Chairman of Committee.

MILWAUKEE, WIS.—The Board of Public Works has advertised for proposals for a 6,000,000-gallon pumping-engine. Bids will be opened July 27.

MIDDLETOWN, CONN.—It is proposed to construct a system of sewage disposal for the State Insane Asylum. Mr. Paul Gerhard, of New York, is consulting engineer.

CHICAGO.—City Engineer Artingstall is planning to build at Twelfth Street, over Chicago River, South Branch, a steel bridge, as strong as those at Rush and Lake Streets, but much lighter. An iron bridge at Jackson Street will probably be built.

The Chicago Gas-Light and Coke Company will construct a shaft and tunnel, at Taylor Street, under Chicago River, South Branch, the city to use it free for water-pipe, electric wires, etc. The shaft will be some 16 feet in diameter and 70 feet below city datum. The West-Side Gas Company want to use the same tunnel. At Jackson Street the Consumers' Gas, Fuel and Light Company will build a similar shaft and tunnel except that the diameter will be only eight feet.

BLACK RIVER FALLS, MINN.—Messrs. Loweth & Curtis, of St. Paul, are preparing plans and specifications for a system of water-works here.

NEW BRITAIN, CONN.—The town will be obliged to consider some system of sewage disposal. Dr. C. A. Lindsley, of the State Board of Health, has just been making an inquiry into the matter, which he says will have to be thoroughly settled.

MONONGAHELA, PA.—The Monongahela City Water Company is asking for articles of incorporation, with the view of furnishing water to the city.

YUBA, CAL.—Plans are wanted from architects, until July 8, for county hospital buildings for Yuba County. Address the Board of Supervisors at County Clerk's office.

KANAWHA RIVER, W. VA., IMPROVEMENTS.—\$250,000 additional has been recommended for this improvement. Last week the works were inspected by the Secretary of War, with Gen. John Newton, U. S. Engineers, and others.

GREENSBURG, PA.—The Water Company will obtain a supply of water from Chestnut Ridge.

MONTREAL, CAN.—The Water Committee has decided that \$58,000 shall be applied to the laying of 24-inch iron water-mains for fire purposes.

CHATTANOOGA, TENN.—The Board of Commissioners of Floyd County have contracted with the Morse Bridge Co., of Chicago, to build the two bridges across the Etowah, on Broad and Howard streets, Rome, for \$19,580. Both bridges are to be single-span, 18 feet wide in the clear, with footway, one 300 feet long, the other 260. The abutments for both bridges will cost \$11,040 more.

PENSACOLA FLA.—The water-works were tested June 27 with satisfactory results.

MILWAUKEE, WIS.—A \$30,000 iron bridge will be built at Pleasant Street.

STAMFORD, CONN.—The Stamford Water Company has purchased the water privileges of W. C. Harding & Company on Mill River and it is expected will increase the water-supply furnished to the town.

GOVERNMENT WORK.

SYNOPSIS of bids for supplying carpets for public buildings for the fiscal year ending June 30, 1887, opened June 24: R. A. Robbins, New York, for Wilton, per yard, \$1.80, for Brussels, per yard, \$1.05; The John Shilleto Co., Cincinnati, O., \$1.89, \$1.04½; J. H. Pray, Sons & Co., Boston, Mass., \$1.80, \$1.05; Peterson & Childs, Washington, D. C., \$2.12½, \$1.08; W. B. Moses, Washington, D. C., \$1.83, \$1.07½. The contract has not been given out, as the samples as to quality will have their weight in determining who is the lowest bidder.

BROOKLYN, N. Y.—Synopsis of bids for iron columns, etc., for first story, and beams, girders, etc., for second story of Post Office, etc., opened June 21: East River Iron-Works, \$14,000; The Marshall Foundry and Construction Co., \$16,242.91; L. M. Morris, \$15,913; Heuvelman & Co., \$16,447; Wallis Iron-Works, \$14,858; Howell & Paxton, \$23,829; Haugh, Ketcham & Co., \$18,441.83; Phoenix Iron Co., \$17,000.

PENSACOLA, FLA.—Synopsis of bids for plumbing materials, etc., for Court House and Post Office, opened June 21: Cook, Horner & Co., \$2,325; Haines, Jones & Cadbury, \$3,081.99; Cincinnati Lead Pipe and Sheet-Lead Works, \$3,369.50.

WASHINGTON, D. C.—Synopsis of bids for wrought-iron pipe and fittings for building for State, War, and Navy Departments: Robert Leitch & Sons, Washington, D. C., \$601.47; William Edgar Bird & Co., New York, \$637.25; Thomas Somerville & Son, Washington, D. C., \$707.

NEW CATALOGUE.

MR. HENRY CONNETT, patent solicitor and expert, Temple Court, New York City, has issued a compendium of useful information regarding patents in the more important countries of America, Europe, and India, arranged in tabular form in the shape of a "Reference Chart."

PERSONAL.

MESSRS. JOSSELYN & TAYLOR, architects, have removed from Des Moines to Cedar Rapids, Iowa.

LATE NEW YORK BUILDINGS.

2nd av, n w cor 26th st, 2 br stores and tens; cost, \$12,000 each; o, Elizabeth R. Fielding; a, G. H. Schillenger.

St. Nicholas av, s e cor 121st st, br flat; cost, \$30,000; o, Simon Haberman; a, G. H. Schillenger.

98th st, n s, 175 ft w of 8th av, br dwell; cost, \$15,000; o, Geo. W. Ford; a, F. W. E. Bloodgood.

506 W 51st st, br flat; cost, \$18,500; o, R. C. Winters; a, C. M. Morgan.

87th st, n s, 300 ft e 2nd av, 6 br dwells; cost, \$9,000 each; o, Julia and Germa Rhineland; a, H. J. Hardenberg.

3rd av, e s, 50 ft n 89th st, br flat and store; cost, \$25,000; o and a, same as last.

312 W 47th st, br flat; cost, \$20,000; o, M. A. Lawson; a, Geo. Keister.

ALTERATIONS.

170 Nassau, br factory, newspaper establishment; cost, \$28,000; o, The Sun Publishing Co.; a, Wm. E. Worthson.

BUILDING INTELLIGENCE.

(Continued from page 102.)

NEW YORK CITY.—(Continued.)

8th av, n e cor 146th st, 3 5-story br tens with stores; cost, each, \$16,000; o and b, Peter McCormick, 172 E 128th st; a, J. H. Valentine.

Washington av, n e cor 164th st, 5 bldgs; cost, total, \$12,000; o, John Aiken, 338 E 16th st; a, Andrew Spence.

Hull av, s s, abt 250 e Southern boul, Bedford Park, 3-story fr dwell; cost, \$8,000; o, Twenty-fourth Ward Real Estate Assoc.; a, W. M. Grinnell.

Willis av, n w cor 142d st, 2 4-story br tens; cost, each, \$10,000; o and b, Augustus Gareiss, 331 Willis av; a, Bart. Walther.

BROOKLYN.

Myrtle av, n e junction Myrtle st, 5 3-story fr (br filled) stores and tens; total cost, \$20,000; o, a, and b, John Rueger, 250 Moore st.

BUILDING INTELLIGENCE.

Broadway, n e cor Weirfield st, 5 3-story fr (br filled) stores and dwells; cost, each, \$4,500; o, a, and b, Cozine & Gascoine, 109 Harman st.

Tompkins av, w s, 180 n Myrtle av, 2 3-story fr (br filled) dwells; cost, each, \$4,400; o, George F. Martens, 86 Irving pl, New York; c, C. F. Thompson.

Magnolia st, s s, 20 w Hamburg av, 4 2-story and bmt fr (br filled) dwells; cost, each, \$2,500; o, Walter F. Clayton, 383 14th st; a, R. F. Clayton.

3d av, n w cor 22d st, 3-story br and terra cotta store and dwell; cost, \$14,000; o, Chas. Fischer, 694 3d av; a, P. H. Gilvary; m, John Kolle; c, Daniel Ryan.

Union st, n s, 242 w 6th av, 6 3-story and bmt b s dwells; cost, each, \$6,000; o, John H. Bowne, 548 Prospect pl; a, Frank K. Irving; c, S. C. and J. H. Bowne.

Marcy av, w s, 50 s Park av, 4 3-story fr (br filled) tens; cost, \$15,600; o, L. Michel and J. Jacoby, 148 Jackson st; a, F. Holmberg.

Sumpter st, n s, 250 e Patchen av, 15 2-story and bmt fr (br filled) dwells; entire cost, \$28,000; o, a, and b, C. P. Skelton, 1895 Atlantic av.

1st st, n s, 142.3 e 6th av, 3 3-story and bmt b s dwells; cost, each, \$6,500; o, Joseph A. Sykes, 377 6th av; a, C. W. Jamison.

Ditmars st, n s, 100 e Broadway, 9 2-story fr (br filled) dwells; cost, each, \$3,000; o and b, Frederick Herr, 784 Broadway; a, Th. Engelhardt.

St. John's pl, s s, 279.3 e 5th av, 10 3-story and bmt b s dwells; cost, each, \$8,000; o and m, John Monas, 92 Park pl; a and c, J. J. Gilligan.

Garfield pl, s s, 259 w 7th av, 5 3-story and bmt b s dwells; cost, each, \$7,000, o, a, and b, C. B. Sheldon, 296 9th st.

St. Marks av, s s, 200 e Nostrand av, 3-story br and s dwell; cost, \$25,600; o, George Follett, 144 Duane st, New York; a, Mercein Thomas; m, C. Cameron; c, W. S. Wright.

7th av, w s, 22 s Berkeley pl, 2 4-story b s stores and flats; cost, each, \$4,000; o and b, C. B. Sheldon, 9th st, near 5th av; a, George W. Bush.

Clinton av, e s, 145 s Myrtle av, 3-story br dwell; cost, \$20,000; o, John F. Dingee, 315 Clinton av; a, Chas. Werner; m, Thos. Donlon.

14 Arlington pl, w s, 100 from Halsey st, 3-story and bmt b s dwell; cost, \$7,500; o, William Westlake, 4 Spencer pl; a, William N. Burhans; b, Otis & Burhans.

Halsey st, n s, 150 w Reid av, 3 2-story and bmt br dwells; cost, each, \$4,200; o and b, Geo. Browley, 250 Steuben st; a, M. J. Morrill.

ALTERATIONS, NEW YORK CITY.

79-81 Forsyth st, altns, iron beams furnished; cost, \$6,000; lessees, Lord & Taylor; a, William Graul; b, W. N. Sternkopf.

805 Madison av, 3-story br exten; cost, \$15,000; o, Ida M. Newcombe, on premises; a, V. H. Koehler; b, not selected.

126 E 39th st, 3-story br exten; cost, \$7,000; o, J. C. Cady, 111 Broadway; a, J. C. Cady & Co.; b, not selected.

5th av, n e cor 61st st, 3-story br exten on Nos. 1 and 3 E 61st st; cost, \$30,000; o, Jabez A. Bostwick, 800 5th av; a, D. & J. Jardine.

3d av, s w cor 16th st, br exten; cost, \$5,000; o, Henry Weymann, on premises; a, D. & J. Jardine.

232-36 Cherry st, raised two stories; cost, \$6,000; o, Myer Finn, 164 E 72d st; a, Wm. Field & Son.

Broadway, s e cor 39th st, fire-proof partition built and windows changed; cost, \$5,000; o, New York Concert Co. (Limited), R. Aronson, President; a, F. H. Kimball; b, J. L. Hamilton.

57th st, s e cor 11th av, raised two stories new front, and internal altns; cost, \$5,000; o, The A. H. Hart Co., on premises; a, G. B. Pelham; b, John Van Dolsen.

29 W 21st st, new stairs, s stoop taken down and reset; cost, \$6,000; o, Catharine Carnagan, on premises; a, Little & O'Connor; b, I. A. Hopper and Garrett Ward.

ALTERATIONS, BROOKLYN.

325 Clinton av, 1-story br exten; cost, \$5,000; o, George L. Pease, on premises; a, Parfitt Bros.

Gates av, s e cor Irving pl, 2-story br exten; cost, \$9,000; o, Trustees Third Unitarian Soc.; a, W. B. Tubby; b, J. Thatcher and Martin & Lee.

BUILDING INTELLIGENCE.

MISCELLANEOUS.

ABERDEEN, MISS.—A union railway depot will be built here.

BIRMINGHAM, MISS.—A union railway depot will be built here.

BALTIMORE, MD.—Linden av, near Mc-Mechen st, 3 3-story br dwells; o, Mrs. D. F. Bump.

Hull, near Marion, 3-story br dwell; o, Ph. Wiegand.

284 Orleans, 3-story br hall; o, And. Miller.

Madison av, near Preston, 3-story br dwell; o, Dr. John Dickson.

Lanvale, near Bolton, 3-story br dwell; o, W. S. Phillips.

249 Hanover, 3-story br dwell; o, Anna D. Rost.

Ridgeby, near Cross, 3-story br dwell; o, A. M. Onnen.

Bond and Oliver, 3-story br dwell; o, Thos. H. Blick.

67-69 McDerry, 3-story br warehouse; o, Isaac Bennis.

289 Gay, 4-story br warehouse; o, Isaac Bennis; a, J. C. Gott.

Caroline and Preston, stone church; cost, \$20,000; o, Grace Baptist Church; a, J. A. & W. T. Wilson.

Clarke and Fremont, serpentine stone church; cost, \$25,000; o, 3d Ev. Lutheran Church; a, W. F. Weber.

The Baltimore club will build a club house on North Charles, near Read street. William T. Wilson is the architect; cost, about, \$30,000.

BOSTON, MASS.—69 Newman, fr stable; cost, \$7,500; o, M. Haggerty; b, A. P. Donovan.

Texas, cor 5th and 6th, fr cattle shed; cost, \$20,000; o, B. & Albany R. R.; b, J. G. Wheeler.

Boylston st, near Boylston pl, fr dwell; cost, \$9,500; o, G. Gramlick; b, J. Sup-pold.

440 Blue Hill av, fr storage bldg; cost, \$12,500; o, Highland Railway; b, Wilson Bros.

Patterson, near Brooks, fr storage bldg; cost, \$9,000; o, H. L. Pierce; b, Lyman H. Clarke.

CLEVELAND, O.—69-71 Ontario, 4-story br Power block; cost, \$19,000; o, Ralph Worthington; a, Cuddell & Richardson; c, Slatemeyer; m, Kiekhein & Schenck.

130-2 St. Clair, 4 2-story br stores; cost, \$5,000; o, Mrs. Bingham.

808-12 Lorain, 3 2-story frame stores; cost, \$6,700; o, Geo. Gerstacker; a, B. F. Vandevlede; b, Geo. Baker.

Cor Jennings and High Level Bridge, 4 3-story frame tens; cost, \$6,500; o, a and b, Adam Emerson.

35-7 Woodland av, 5-story br bldg; cost, \$14,000; o, Herig Bros.; a, L. P. Eldredge; m, Jos. Hackman; c, J. Rockford.

In last week's report 1154 Superior, 6 double frame dwells, 2-story, should have been 1154-6 Superior, double frame dwell, 2-story.

A 4-story br block will be built at St. Clair Street and Park Place, for M. G. Wallerson; cost, \$30,000.

At corner of Willson and Sixth Avenue, a block for Dr. T. M. Mehard, of Wampum, Pa.

CINCINNATI, O.—Cor Richmond and Central av, 4-story flats and store; cost, \$10,000; o, B. Trum & Son; a, Gustave W. Drach; b, Horst & Rolfes.

8th and Lock, 3-story br factory; cost, \$8,000; o, Stern & Langerbeck; a, Gustave W. Drach; b, Wm. Wicker.

N e cor Blue Rock and Delaney, 3-story br bldg; cost, \$6,000; o, Mary Feeny.

Vine, bet Corry and Calhoun, 3-story br bldg; cost, \$10,000; o, F. L. Graeder.

N w cor Brown and Eliza, 3-story br bldg; cost, \$8,000; o, Jno. Korbel.

N e cor 8th and Leack, 2-story br bldg; cost, \$10,000; o, B. Sturm.

N e cor Bates and Colerain av, 2-story br bldg; cost, \$6,000; o, Chris Becker.

Mt. Auburn, dwell; cost, \$30,000; o, Mrs. Gibson; a, Plympton & Trowbridge; b, not let.

THE SANITARY ENGINEER.

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THE CARE AND DISPOSAL OF THE DEAD.

ABOUT forty-five years ago a great sensation was produced in London by the results of investigations into the condition of the burial-grounds located within that city. The details of the condition of things found to exist by the inspectors are in some cases disgusting, and the result was that intramural interments were practically stopped.

From time to time ever since there have been reformers, sanitary or æsthetic, who wish to do away with earth burial altogether, and to substitute for it cremation, or destruction of the dead by fire. If a man chooses to direct that his body shall be cremated we see no objection to complying with his wishes. Under English law a man cannot direct the disposition of his body after death, his executors alone having that power, but, as a rule, no doubt the testator's wishes would be complied with. The case is a little different where the proposal for cremation comes not from the man himself, but from his executors or relatives. Here there is room for the suspicion that there has been some foul play, and that the unusual process of burning the body is resorted to in order to make it impossible to obtain satisfactory evidence as to the cause of death in case suspicion should be aroused at a later period. This difficulty might, however, be done away with by requiring a careful post-mortem examination of the body prior to its cremation, including, if need be, an examination of the viscera for poisons.

It does not seem, therefore, wise to refuse to legalize cremation, and this view has evidently prevailed in the French Chamber of Deputies, which, after a long discussion on the 30th day of March last, agreed, by a vote of 321 to 174, to so amend the law relating to funerals that every person competent to make a will may direct how his dead body shall be disposed of, whether by inhumation or by cremation.

But while no restriction on the liberty of individuals in this respect is desirable, it is quite another matter to urge that cremation should be substituted for burial in all cases. The great argument used by the advocates of this last idea is that earth burial is dangerous to the public health because of the air and water pollution which it produces, and especially because it may thus be the means of the transmission of the germs of contagious disease. The effects of cemeteries upon the health of those living in their vicinity has been extensively and carefully investigated by competent inquirers in recent years, and the result is that there is no evidence as to the production or spread of disease from such a source. Of these investigations, one of the most interesting was that made in Saxony to determine the changes which occur in bodies buried in the ordinary way, and the results of which were reported by Dr. V. Rheinhard in 1882. A number of bodies which had been buried for different lengths of time were disinterred and their condition carefully noted. This

was done for various kinds of sepulchres, and for the rich as well as the poor. It was found that in all soils the soft parts of the adult human body are completely destroyed in seven years, and that, as a rule, fœtor disappears in three months unless the body has been placed in an air and water tight burial-case. The clothing resists changes longer than the corpses. No proof was found that the health of those dwelling near churchyards was thereby injured.

The chief danger to health from suburban cemeteries is from the pollution of subsoil water which they may occasion. The amount of this danger depends in part on the geological structure and surface topography of the ground and the direction of flow of the subsoil water, and in part on the distance of wells or springs from the cemetery.

In attempts to protect or promote the public health it is wise, as a rule, to deal first with those dangers which are the greatest, the most obvious, and the easiest remedied, and not to run the risk of wasting force for want of concentration of effort. The dangers to health which are connected with the dead are chiefly connected with the mode of caring for the body prior to its interment; in comparison with these the dangers due to cemeteries are comparatively insignificant. The spread of contagion by funerals, the keeping of a dead body for several days in the house, and, in the case of the poorer classes, in the living rooms of the family—these are the first things to be guarded against.

The most urgent need in our large cities is for small mortuary houses located in or near the centres of the tenement-house and poorer population, to which houses the body can be taken immediately after death and be properly cared for, instead of being left in the bedroom of the family.

None but those who have themselves seen what occurs when a death takes place in a family occupying two rooms in a tenement-house can appreciate the diminution of suffering and of danger to the public health which a few well-located and properly managed houses for the reception and care of the dead would cause in a crowded city.

We are not opposed to cremation. It does not seem to us to be a matter of much importance whether a man's dead body be burned or buried; but we do think that the first efforts of sanitary reformers should be directed toward securing more decency, less cost, and less danger of contagion in the way in which the majority of the dead in our great cities are now cared for before they are at last committed to the keeping of Mother Earth.

THERE is a statement in one of the three essays printed in this issue from among those presented at the Deer Park Convention of Master Plumbers which may be briefly commented on. The essayist of the New York association takes occasion to remind his readers that, entirely contrary to public opinion and common

jest, the master plumber is underpaid. "Notwithstanding the popular idea that there are millions in it," he says, "I venture to say that 75 per cent., or more, of the men within the sound of my voice never reached the means they possess solely through the prosecution of the plumbing business," and the opinion of the convention went along with the assertion of the essayist. Some years ago we were at pains to discuss this matter editorially, showing the very reasonable nature of a plumber's profits, and we commend this statement of the essays to our readers' attention. A good deal has been said about diamonds, and one very large one—fairly a rival to the Koh-i-noor—was exhibited at Deer Park, but plainly the average plumber does not expect to wear one.

grounds of objection do not seem to be so much against putting this upon the market, as against the custom of putting it upon the market as beef, etc. It would appear to stand very much upon all fours with the relative positions of butter and butterine. Butterine, although wholesome, may not, under the provisions of the Adulteration Act, be sold except in its own name. It would seem, therefore, only just that horse-flesh, which is also wholesome, should be brought in the same way under the provisions of the same act.

The owners of two houses in Warren Street, Tottenham Court Road, have just been summoned by Mr. Rouch, the Inspector of Nuisances for the St. Pancras District, for allowing their premises to be in such condition as to be injurious to public health. The houses were of the common lodging-house class, and the statements of the inspector disclosed a state of things which must have been in existence, or, at all events, in progress during a very considerable time, showing the necessity both of a larger staff of inspectors for the very populous and extensive district and of increased powers for summary action, such as the

ease-breeding spot? The powers vested in a magistrate to order the diminution of the nuisance are not at present sufficient to exercise deterrent influence on the owners of these small properties, which are occupied by the poorest classes, the people who, of all others, are most susceptible to unhealthy surroundings. Neither of the parties summoned thought it worth while to attend; knowledge of the fact that the only result of the application on the part of the inspector would be an order to diminish the nuisance, and that they would not be subject either to fines or imprisonment for playing with the lives of their tenants rendered it unnecessary. Under existing circumstances it pays these men to run the chance of a summons. The circumlocutory process necessary before inspectors can put pressure on the offenders and the lame conclusion gives them every encouragement to run the risk. Offenders of this class should be subjected to fines or imprisonment. Cases are continually presenting themselves of defective, both entire and partial, water-supply for water-closets in these poor lodging-houses. Frequently it is stated that the water-rate has not been paid by the owner of the house. In



"THE COTTAGE," BUFFALO, N. Y.

OUR BRITISH CORRESPONDENCE.

Stopping the sale of Diseased Meat in Leeds—Horse-flesh—House Nuisance Prosecutions in Tottenham—The Auxiliary Water-Supply of Calcutta.

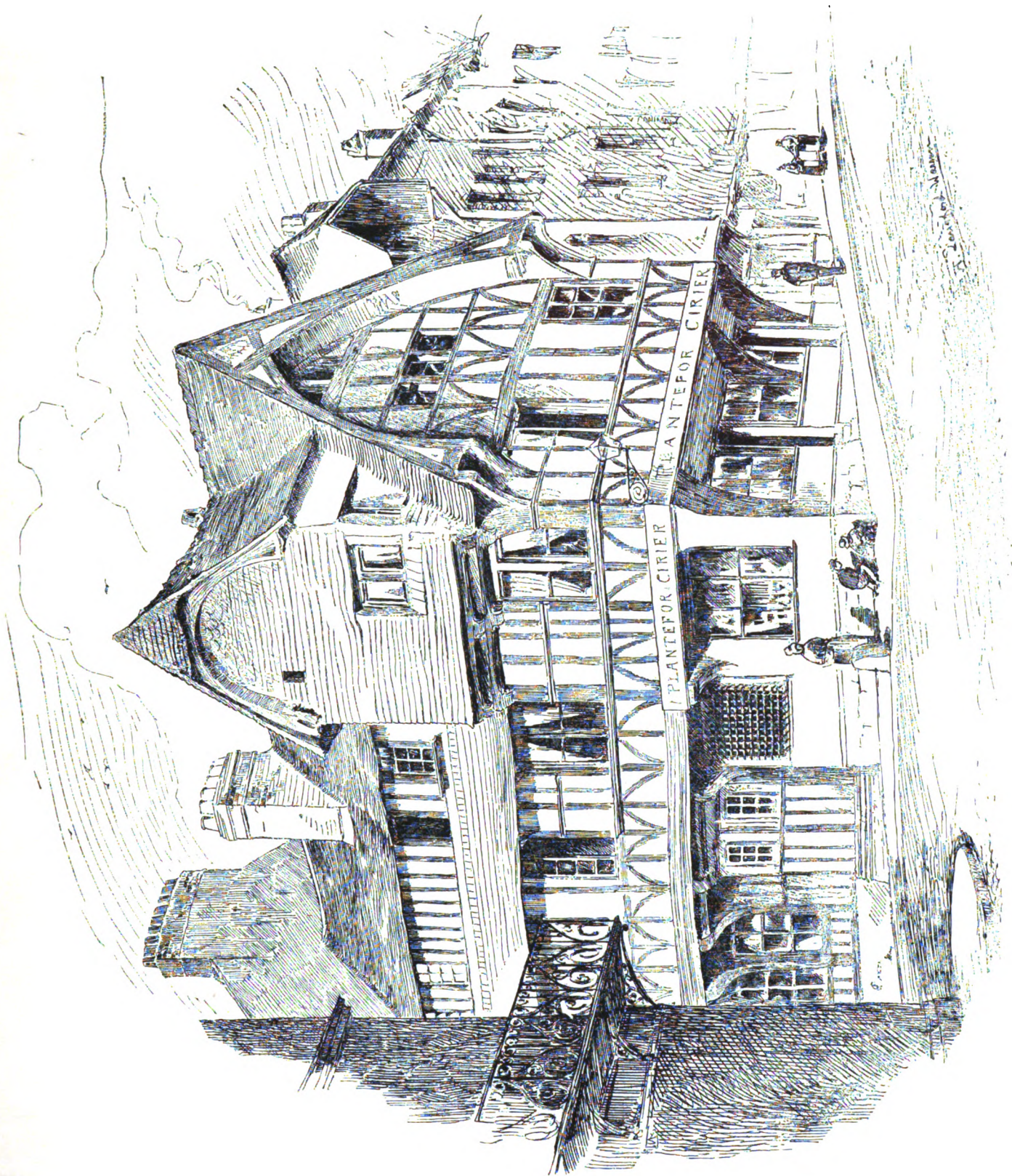
LONDON, June 19, 1886.

THE Magistrates are beginning at last to be alive to the fact that the "diseased meat" trade is a public offense which is not to be adequately met by a fine of a few shillings. The credit is really due to the authorities of Leeds for initiating this new state of affairs. During the last few weeks, men have been sentenced to terms of imprisonment varying from one month to sixty days, without the option of a fine, for offering for sale diseased flesh. It is to be hoped that the infliction of a few severe terms of imprisonment will convince these gentry who purchase the carcass of a beast for a few shillings and put the flesh upon the market as fit for human food of the injurious nature of that business. In this connection, I would note that there is an agitation among a certain class of butchers against the sale of horse-flesh as human food. Their

Association of Sanitary Inspectors is now endeavoring to obtain. The drains were apparently completely stopped and ineffective as such. The sewage had forced its way through the joints, was running all over the back yard, had percolated the wall, and accumulated under the floor of the kitchen. Some half-dozen people lived in this kitchen. The area in front of the house was also flooded, and the traps being stopped and ineffective from improper joints, etc. Facing this area was a cellar occupied by a man who retailed fish to the poor of the neighborhood, and who had a stock on hand already cut up for sale. Apparently, no action was taken to stop the sale of this fish. The magistrate ordered one of the houses to be closed until the necessary alterations had been made, and made an order in the other case for the nuisance to be abated and remedied within a week. The question obviously presents itself as to the extent of the remedial measures to be adopted, especially in view of the time granted in which to carry them out. Given a wall saturated and with sewage, with the earth under the flooring the same, what step short of a wholesale excavation and substitution for the saturated parts will suffice to remove such a dis-

such cases where the rents are regularly paid by the lodgers it should surely be made a criminal offence on the part of the house-owner to endanger the lives of his lodgers or tenants, and in cases where fatal illness occurs he should lay himself open for trial for constructive homicide.

I referred a few weeks since to the completion of the works for an auxiliary supply of water to Calcutta. It would appear that this extension is none too soon. Discussion in Calcutta is rife as to whether ratepayers are subject to the payment of water rates, whether they get water or not, the supply being at present quite insufficient to meet the demand. Under the Municipal Act of 1876 the Commissioners are authorized to levy an *ad valorem* rate of six per cent. on property in such streets where mains for the supply of filtered water are laid, and five per cent. in those where mains are not laid. According to Section 131 of the act, it is set forth that during certain hours there shall be a pressure maintained "sufficient to raise the water in all houses and places where it may be introduced to a height of not less than 50 feet." This clause seems to be a dead letter, the pressure stipulated



THE SANITARY ENGINEER ILLUSTRATED SERIES.

AN OLD HOUSE AT LISIEUX, NORMANDY.

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NEW YORK, VOLUME, XIV.

not being given, and for those likely to take the trouble to bring the matter into court, there would seem to be no reason why anybody in Calcutta need pay any water rate at all, the more so as in some cases I hear there is absolutely no supply. A combination against the rate would put the water company in a very awkward position, and it is therefore a matter of congratulation to all concerned that the new works are completed.

SAFETY-VALVE.

OUR SPECIAL ILLUSTRATION.

AN OLD HOUSE AT LISIEUX, NORMANDY.

THE old house we illustrate this week is situated at Lisieux, in Normandy, on the corner of a street leading to the south porch of the cathedral and hardly a stone's throw from it. It is a fine example of the mediæval half-timbered house, and probably belongs to the 14th century. Our plate is from a sketch made on the spot in December, 1884.

OUR ILLUSTRATION OF A MODERATE-COST HOUSE.

"THE COTTAGE" AT BUFFALO.

THIS is one of the oldest houses in Buffalo, N.Y., and was built by Dr. Ebenezer Johnson, who was the first elected Mayor of Buffalo and served two terms, from 1824 to 1826. The house at that time was almost a mile from the village of Buffalo, and was a fine suburban residence. The grounds were laid out with a lake, deer park, etc.

The house was burned about 1835, but was reconstructed in the same walls, which are of gray stone. The piazza-posts, cornices, etc., are of wood. The house is now occupied by the Buffalo Female Academy, and is known as "The Cottage."

UNDERGROUND RAILWAYS IN CITIES.

No. IV.

(Continued from page 10.)

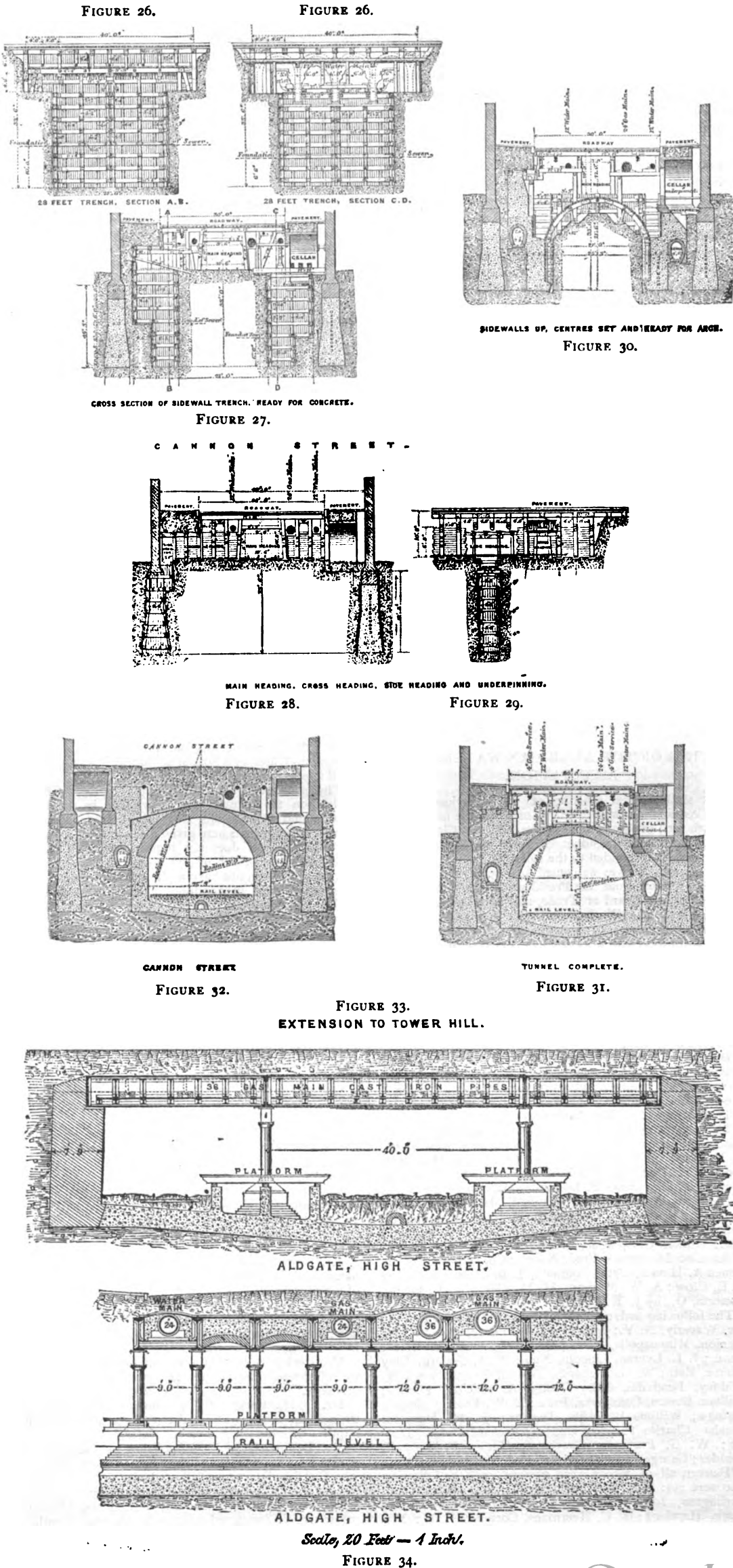
SPECIAL WORKS (CONTINUED).

FIGURES 26 to 32 inclusive are given to show the latest method adopted in executing the works under a street. The first operation was to lay down between the hours of 6 P. M. and 6 A. M. 12"x12' timbers across the street placed at 4-foot centres. On these were closely placed 4-inch planking longitudinally, and on these 3-inch cross-planking for a wearing-surface. See Figs. 26 and 27, the former being a longitudinal section looking from the street centre. A main heading about 10'x10', Fig. 27, was then driven under the centre of the street, and from this "cross-headings" about 3'x4' to the foundations of the buildings on each side. From these small side-headings 3'x5' were driven along the faces of the foundations (Figs. 27 to 29). Holes were then sunk to the full tunnel depth, about four feet square at top and widened across the walls at bottom to six feet, and the wall underpinned with concrete. By means of a succession of these properly located the whole wall was secured against damage.

The trenches were next excavated for the side walls of the tunnel and the sewers where required, involving considerable shifting of timbering. Then the side walls and sewers were built, the timbers again arranged, and the arch centres put in as in Fig. 30. It will be here noted that where no vaulting exists the longitudinal timbers under the sidewalks are not removed, but the concrete is filled around them; also, that the "dumpling" remains in place.

The arch is now turned, the gas and water pipe supported on the back of the arch by piers, the backing put on, and now the dumpling is removed and the invert turned (Fig. 31). The invert is considered a very essential feature in difficult ground, and its omission in some of the early work caused trouble from a slipping in of the walls from the heavy external pressure. Mr. Baker does not think them to be universally necessary. Finally, the earth was filled in and allowed to settle, and, when well consolidated, the timbers were all removed and the street-surface restored, giving the complete section, Fig. 32.

Figure 33 is a cross-section, and Fig. 34 a part longitudinal section of the station at Aldgate. The excavation here reached thirty feet depth. Two 36-inch and two 24-inch mains are carried across overhead and supported by the girders, the central span being forty feet. The girders are plate-girders of about four feet depth. Some of these girders on the recent work have flanges 5¼ inches thick



and two feet six inches wide, made up of nine separate plates, and the remark was made by way of criticism that "one might well wonder whether the riveting could act with proper effect through such an enormous mass." American engineers do not think it sound practice, and would in all such cases increase the number of girders rather than adopt it.

In reply to a question whether in treacherous ground the amount of subsidence was increased or diminished by leaving in the crown-timbers over a tunnel and building in between them with brick-work in cement, Mr. Barry said: "No doubt crown-bars of tunnels *ought to be built in* with brick-work in any dangerous ground, and the small expense of the extra brick-work would be amply repaid."

Mr. Baker mentioned the desirability of a thorough drainage of the soil by pumping some time in advance of the excavation, to avoid the danger of drawing sand from under foundations. To do this sumps nine feet in diameter were sunk to, at least, the full depth of the proposed excavation, for pumping from. These should be at some distance from the buildings, as pumping near buildings is liable to disturb the sand and cause settlement.

We have already mentioned some general items of cost. The net cost of the line, land and all included (about five-eighths of a mile), between the Mansion House and Trinity Square, was about \$1,400 per foot of length, or at the rate of \$7,500,000 per mile, and that part under the statue of William the Fourth cost \$150 per inch.

The total number of passengers carried by the whole line in 1863 was 9,455,175, and receipts over \$500,000. In 1884 the number carried was 114,500,000, and the receipts were \$5,060,000, and the traffic is still growing. It is now felt that the traffic of London could not be carried on without the underground railways, and that they have been an important element in the growth and development of the city.

(TO BE CONTINUED.)

MEETING OF THE AMERICAN WATER-WORKS ASSOCIATION.

THE sixth annual meeting of the American Water-Works Association was called to order on the morning of the 24th ult., in the Council Room of the City Hall at Denver, Col., with President Milne in the chair. About forty members responded to the roll call.

The convention was welcomed to the city by addresses from the Mayor, from the President of the Chamber of Commerce and Board of Trade, and the President of the Denver City Water-Works.

To these remarks of welcome the President replied briefly and proceeded at once to the delivery of his annual address.

Reading of the minutes of the previous meeting and letters of regret were dispensed with. On recommendation of the Executive Committee, consisting of Messrs. Milne, Jones, Milner, and Decker, the salary of the secretary for the past year was fixed at \$200. The reports of officers were read and filed.

During the past year the association has gained forty active and six associate members, having now a total membership of one hundred and seventy-eight active and forty-five associate members.

The amount of cash on hand was \$36.

The following active members were present: G. E. Beach, Minneapolis, Minn.; Calvin S. Brown, New York; R. D. Wirt, Independence, Mo.; J. H. Decker, Hannibal, Mo.; A. H. Denman, Des Moines, Iowa; J. M. Diven, Elmira, N. Y.; James P. Donahue, Davenport, Iowa; L. H. Gardner, New Orleans; Frank W. Holley, Lockport, N. Y.; R. Holme, Jr., Denver; B. F. Jones, Kansas City; Peter Milne, Jr., Brooklyn; W. J. Milner, Birmingham, Ala.; William G. Sprague, Chicago.

Associate Members.—Fred. Ade & Co., represented by James A. Hause; Peter Connelly, J. B. Clow & Sons, by F. E. Clow; A. W. Morgan, H. Mueller, W. L. Payne, Fostoria, O., by J. K. P. Otis.

The following active members were elected: J. T. Sawyer, Waverly, N. Y.; John W. Troy, Pierre, Dak.; J. W. Henion, Minneapolis, Minn.; Henry W. Ayres, Hartford, Conn.; J. L. Lyman, Lincoln, Neb.; A. A. Godard, Clay Centre, Neb.; W. G. Richards, Alanta, Geo.; Charles N. Priddey, Leadville, Col.; George A. Shields, Pueblo; William Bowen, Oskaloosa, Iowa; E. W. Frost, Colorado Springs; William B. Mills, Denver; J. H. Dumont, Omaha; Charles T. Allen, Denver; Richard Holme, Denver; W. G. Provinas, Cheyenne; James P. Maxwell, Boulder; George W. Brown, Longmont; and James Archer, of Denver, all of whom were present, and the following who were not: D. C. Fry, Jacksonville, Ill.; Charles Hood, Burlington, Iowa; Samuel McElroy, Brooklyn; Ezra Clark, Hartford; H. C. Heermans, Corning, N. Y.; Myron Wiltzie, Rapid City; Louis Harper, Rapid City; H. Ruhn, Davenport, Iowa; H. G. McConnell, New Brighton, Pa.; J. I. Jones, Leaveworth, Kan.

The following associate members were elected: Reading Iron-Works, Philadelphia; E. H. Kellogg & Co., New York; Davis, Creswell & Co., Denver.

The meeting then adjourned until 2:30 P. M.

The afternoon session was called to order at 2:45. It was opened by the reading of a paper on "Self-Closing Work, and Rules Which Govern the Same," by Mr. B. F. Jones, Superintendent National Water-Works Company of Kansas City. The following is a synopsis of Mr. Jones's paper:

"This subject is important, and is so closely akin to another important subject—namely, waste and waste-prevention—that I must necessarily speak of both. We know there is waste, and we can find it, but, when found, what will you do with it? The two systems of waste-prevention—namely, first, inspection and enforcement of penalties; and, second, measuring and charging for the quantity taken—may be compared by supposing a given establishment to be furnished with gas at an annual rental, dependent upon the carefulness of the occupants, and an occasional visit by an inspector. The suggestion is absurd, and yet it is precisely what we do in every case where we take premises with poor plumbing or careless occupants. Meters are beyond a doubt the surest remedy. In Kansas City we have over 500 meters in use. The majority of men don't care anything about the waste. Experience in these matters caused our company to adopt a rule requiring all faucets in public places to be of the self-closing variety. Some three years ago we adopted the rule that all faucets over basins and sinks, as also urinals and closets, should be operated with self-closing valves that close with 'pressure.' I am perfectly satisfied that work closing with pressure is best."

A paper by Mr. L. A. Taylor was then read by the secretary on the subject of "Water-Meters: Their Setting and Care." The following are extracts:

"I think that meters are destined to bear even a more important part in the future of water-works than in the past, and their extension will be rapid in the next few years. The setting of a meter should be under the direction of the official or employees. They should be well protected from frost and easily accessible. The setting of meters in streets is objectionable. Meters are subjected to so much hard usage that stoppages often occur. A sediment of only a few thousandths of an inch will retard the workings of a meter. These are a few of the many thoughts suggested on the subject. They will serve to introduce the subject to the association and open a way for a discussion."

Mr. A. C. Sekell was not present, and his paper on "Ground-Water as a Source of Supply" was passed over until a later session.

The secretary then read a paper by Mr. Charles B. Brush, on the subject of "Discipline in the Pumping-Station, and Regulations Governing Engineers and Firemen." A synopsis is here given:

"This subject does not require extended discussion. The executive officer of the company should select an engineer, who should have both technical knowledge and large experience in handling men. The men should be under his complete control. The engineer should be required to send to the company a daily report, showing the number of strokes of the engine, gallons pumped, pounds of coal, ashes obtained, amount of oil, rainfall, temperature, etc."

"Lax discipline usually arises from lack of concentrated authority. No appointments should be made without the consultation of the engineer."

Mr. Gardner, superintendent of the water-works at New Orleans, took part in the discussion, giving some interesting information, in which he related his personal experiences with reference to the employment of men, and to the discipline in the pumping-station.

On motion of Mr. Milner, of Birmingham, Ala., Mr. Gardner's remarks were ordered incorporated in the records.

The regular business of the afternoon session being completed, on motion of Mr. Cameron, the proceedings of the evening were anticipated, and the question-box opened.

The first question read by the secretary was: "Does a water company sell water or lease a privilege in its supply to unmetered consumers?"

The discussion on this question which followed was long and animated.

Mr. Milner was of the opinion that it partook of the nature of both. He thought it ought to be in the nature of a real-estate tax.

Mr. Goddard thought the water in the mains belonged to the water company. The consumer owns the pipes, but not the water in the pipes. It seemed to him a sale of an indefinite quantity of water.

Mr. Decker said: "If a man abuses the privilege, then we sell through the meter. But while unmetered it was a privilege."

Mr. Goddard said: "The company sells the consumer the amount of water he requires. If he takes more than he requires he takes the company's water."

Mr. Denman stated the question as follows: "The question is, has a water company any property in the water? The English digests are full of decisions to the effect that the water companies have absolute property."

Mr. Hastings then made a motion to the effect that a committee be appointed to consider the cost of publishing a condensed report of the meetings and papers read since the organization of the association, and that said committee report at the Friday morning session.

The motion was carried. The president appointed on the committee Messrs. Beach (chairman), Lyman, and Cameron.

The question next discussed was: "Is the system of drive wells practical for pumping-works as a source of supply?"

This was discussed at length by Mr. Hastings. He was of the opinion that wherever there is enough water for drive wells there is enough for open wells at a greater convenience and less expense.

The question, "What is the best method of placing a protecting meter when it is not practical to place it in the cellar?" was next discussed. Messrs. Milner, Cameron, Milne, and Henyon gave their views on this question.

Messrs. Jones and Denman then discussed the question, "Has a company a right to charge a minimum rate where the customer furnishes the meter?"

The question-box was then declared closed until the evening session.

In the evening the delegates and ladies visited the water-works.

The second day's meeting was held at the Albany Hotel. Reports of special committees being in order the report of the Committee on Constitution and By-Laws was heard and adopted.

The time fixed for the annual meeting of the association was the second Tuesday in April. The Executive Committee was given power to alter the date when circumstances demand it.

The committee appointed on printing proceedings recommended that the reports of the proceedings be revised and condensed and the proceedings of this meeting be incorporated and the whole be printed with an edition of 1,000 copies, that the association appropriate \$250, and each member be taxed \$2 each to meet the expense of the publication. The report was laid on the table.

The reading of papers was then taken up, and Mr. L. H. Gardner, of New Orleans, read some papers on "Poisoning from Lead Pipes." He had two papers to present, and he introduced them with a short paper of his own. These papers will be printed in THE SANITARY ENGINEER.

Mr. Gardner's papers were ordered spread upon the records.

The secretary, Mr. Decker, had samples of lead pipe taken from near his works near Hannibal, Mo., showing that a coating had been formed on the inside of the pipe after the pipe was in use six months.

President Milne said the people of New York have drunk water out of lead pipes for forty years with no harmful results. There are 106,000 lead connections in the city, and investigation failed to show any serious results. In his twenty-eight years' experience he has never seen a case of lead-poisoning resulting from the use of water passing through lead pipes.

The secretary cited the investigation of a chemist who analyzed water which had stood in lead pipes for months, with the result of finding no trace of lead in the water.

Mr. Beach said unless there is some acid held in solution in the water which will act upon the lead there is no harm. He gave instances of acids in water in certain parts of Illinois.

Mr. Denman gave the evidence of an eminent chemist to the effect that of the millions of people who use water out of lead pipes there might possibly be one who has died from poisoning from water taken through lead pipes.

The president read a letter from a chemist desiring information on the service of galvanized-iron pipe. The president's experience was that the pipes were serviceable for seven years.

Mr. Sawyer wanted to know whether the limit of the service was seven years.

The secretary had had galvanized-iron pipes in service or his company for six and one-half years, and was obliged to take up quite a number of them.

Mr. Donahue said his works had run with galvanized-iron pipe for thirteen years, and he had been obliged to take up but few pipes.

Dr. Diven, of Elmira, N. Y., said his works had been running fifteen years and he had never dug up a galvanized-iron pipe.

Mr. Holme asked the president's experience in the service of lead pipes, and he replied that it was very good.

Mr. Holme had never had occasion to take up lead pipe during his nine years' connection with the Denver Water Company.

One of the members of the association, a chemist, had made several experiments with water and lead pipes. His investigations, he said, proved that water having organic properties would take up the lead. He had proved it by precipitating the lead. Waters carrying carbonate of lime and silica did not take up lead. The latter formed a coating on the pipes of a carbonate or oxide of lead.

The discussion of lead and galvanized-iron pipes was continued through the morning session.

In the absence of the President, Vice-President W. J. Milner, of Alabama, called the afternoon meeting to order.

Mr. Holme inquired what was the custom of companies in charging for the use of water for flushing privy-vaults connected by plunger-valves to the sewers of which there are a few in Denver. His customers objected to the charge on the ground that the water thus used was waste-water, though Mr. Holme made a charge on the ground that the

construction of the pipes was such that any amount of water could be used.

Mr. Donahue had some few similar cases, but no charge was made by his company on the ground that only waste was used. However, the laying of the pipe was not similar to Mr. Holme's cases.

Mr. Bowen propounded the question, "Is it economical and safe to use fire-hydrants for supplying sprinkling-carts with water, and what appliance is best for the purpose?"

Mr. Dumont, of Omaha, said their water-carts took water from the fire-hydrants and the company found that the waste saturated the ground with water to such an extent that early in the winter the pipes froze. The company finally stopped it and put on an extra valve which prevents the waste of water.

Mr. Holme said that in Denver the city's contract gave the city the right to use the water for sprinkling the streets. The company protested to the use of the hydrants. The city owns the hydrants and claims the right to use them as it chooses. The company opposed it for six years and now the city is coming to the conclusion that it is not economical and safe to use the hydrants and they are providing for an extra and separate opening for the purpose of supplying water-carts.

It appeared to be the opinion of most all speakers that the practice of using the fire-hydrants for this purpose was not safe.

Mr. Holme offered the following resolution:

"Resolved, That it is the opinion of this association that fire-hydrants should be used exclusively for fire purposes and that the safety of any city depends upon the rigid enforcement of this rule."

Mr. Donahue moved to amend by adding, "that if used for any other purpose it should be with the consent of the superintendent of water-works."

Mr. Milne said that in Brooklyn there are 4,000 hydrants. The street-sprinkling there has proved disastrous to fire-hydrants. It is impossible to maintain perfect fire-hydrant service where men outside the Fire Department are allowed to use them. The inspector's report to the city of Brooklyn showed that 35 per cent. of the hydrants out of order were so occasioned by sprinklers. In his judgment the hydrants should be used for no other purpose than for fire, but he thought that Mr. Donahue's amendment was fatal. He thought the rule should be absolute.

Mr. Beach favored the resolution without the amendment.

The motion was carried, and the resolution was adopted without the amendment.

"Fungus or Mossy Growth in Clear Water" was the subject of a short paper by E. H. Keating. The paper was a recital of the author's experience and examinations of water carrying with it a fungus or mossy growth, and was largely technical in its composition.

Mr. Holme said the subject was one of the most important questions to him. In the month of March the company began to furnish clear water from an underground source. A month later this mossy growth occurred in great quantities. Thinking it was due to the fact that the bottom of the reservoir was of earth, they put in a bottom of stone, and in a few months the growth appeared again. They then adopted a means of cleaning the reservoir, and brooms and scrapers were used to wash and clean the reservoir. The physicians say that the growth is taking out of water something that was in the water and does not injure the water, but if it dies and rises it becomes offensive. "We discover that this growth is in clear water. If we turn in muddy water the growth disappears. We discovered the stuff did not grow below a depth of fifteen feet."

Mr. Jones, of Kansas City, said: "We have had some trouble in our city. We take poles and get out what we can, and then we put salt and lime around the edges. It only appears in warm weather, and I concluded that it was a chemical change in the water."

Mr. Sawyer said that he had a similar experience to Mr. Holme. His reservoir was forty-eight feet deep.

Mr. Allen suggested that where sunlight was excluded the moss did not grow.

Mr. Gardner suggested that a lot of scrap iron be put in the bottom of the reservoir as likely to give a good result.

A gentleman from Boulder said that he had two lines of pipe passing through his reservoir, which might be the reason that there was no mossy growth in his reservoir.

Mr. Beach cited an instance where slacked lime has been used with beneficial results.

Mr. Milne spoke of a New York reservoir which had been affected by "fish-nests." After these were looked after the mossy growth appeared. This was six years ago. "We find that we have to clean the reservoir regularly, and that is the only way we can keep clear of it."

"Pumping-Engines," by John W. Hill, was the next paper. The paper described the pumping-engines now in use by the water-works companies, with a passing reference to the pumping-engines that had gone out of use. The Worthington engine was discussed at some length and the results of some experiments were given. The Corliss engine and trials made with it were given consideration, and various other engines and their work received notice by the paper, their relative performances being considered at some length.

"Water for Public Supplies" was a topic upon which Col. William Ludlow had been requested to prepare a paper. Colonel Ludlow was unable to prepare the paper for this meeting, and on motion the subject was continued for Colonel Ludlow to prepare a paper on for next year.

A short paper on "Coal Tests," by J. G. Briggs, was read.

"Steam-Boilers and Their Settings," by Charles A. Hague, was the next paper read. It treated of the results

of experiments in the attainments of boilers under varied circumstances, and with different fuels and amounts of fuel.

Mr. Milner asked: "What are the advantages of a steam-dome?" A gentleman had told him that the dome had the effect of giving wet steam instead of dry steam.

Mr. Craig said the Hartford Boiler Company had come to the conclusion that the dome was not necessary and that there was no advantage in it.

Mr. Beach said he had had some experience in perforated pipe and steam-domes. In the former, in taking steam from the top of the boiler, it drew the water up on the side of the boiler and had the means of burning out the flues. The object of the dome is to give the cylinder dryer steam than if the steam is taken from lower down on the boiler. He was satisfied that the steam-dome had a great advantage.

Mr. Decker, in twenty-five years' experience, could see no advantage in the use of perforated pipe.

Mr. Decker also gave the results of some of his experiments in using coal. He showed that in using a fine grade of coal—that is, very small nut coal—better results in obtaining steam are obtained.

Mr. Milner wanted to know how to get rid of scales and mud from boilers.

Some one suggested the use of artesian water.

The president said some experiments are being made in New York with electricity for the purpose of preventing the deposition in boilers.

Mr. Decker said the Quincy Water Company is using an electrical process to prevent scales with considerable success.

The papers on "Street-Mains" and "Private Water Companies" were not presented; a voluntary paper by J. G. Briggs on the subject of "Private Water Companies" was read by the secretary. The paper was a humorous statement of the difficulties with which private water companies have to contend.

On motion the paper was spread upon the records.

"Specifications for Cast-Iron Pipe," by the President, Peter Milne, and A. H. Howland was read by title.

A paper on the subject of iron pipes, by Mr. G. W. Pierson, of Kansas City, was read.

Mr. Maxwell wanted some information as to the weight of pipe. He wanted to know what was the lightest 20-inch pipe he could use in enlarging the Boulder Water-Works. He said the pipe would have only twenty pounds pressure.

The president read a number of specifications for Mr. Maxwell's information.

A letter from Mr. H. F. Dunham was read, stating his regrets at being unable to be present, and read a paper on private water companies, and saying he would be pleased to present such a paper at next year's meeting. On motion, the subject was continued for Mr. Dunham to present a paper on it at the next meeting.

Mr. Cameron, of Memphis, moved the thanks of the association be extended to Mr. Pierson for his paper on iron pipes, and the motion was carried.

The chair appointed the following committee on nominations for officers: Messrs. L. H. Gardner, John Donahue, Richard Holme, Frank W. Holley, and Henry W. Ayers.

A closing session was held late on the morning of the 26th. Considerable discussion was had as to the providing of means for the publication of the accumulated papers of the society, and speeches were made for and against the proposition to admit advertisements as a source of revenue, the proposition being finally carried by a small majority.

The following officers were elected for the ensuing year:

President—B. F. Jones, Kansas City, Mo.
First Vice-President—W. L. Cameron, Memphis, Tenn.
Second Vice-President—H. G. Holden, Lowell, Mass.
Third Vice-President—J. M. Diven, Elmira, N. Y.
Fourth Vice-President—W. J. Milner, Birmingham, Ala.
Fifth Vice-President—Richard Holme, Denver, Col.
Finance Committee—James P. Donahue, A. H. Denman, and J. T. Sawyer.

Secretary and Treasurer—J. H. Decker.

It was decided to hold the next meeting at Minneapolis, and, after the usual complimentary resolutions, the convention finally adjourned.

A very enjoyable affair was the banquet tendered to the association and the city officials, on the night before the adjournment, by the Denver Water Company.

The main dining-room of the Albany Hotel presented a very inviting scene when about one hundred guests seated themselves about ten o'clock. The decorations were very fine and the menu excellent.

Friday afternoon many members visited the source of the Denver water-supply, and on Saturday they indulged in an excursion over the Colorado Central Railroad to Silver Plume.

SOME RECENT WATER-WORKS REPORTS.

THIRTEENTH ANNUAL REPORT OF THE LOWELL, MASS., WATER BOARD. January 12, 1886. (Population in 1880, 59,475.)

SIXTEENTH ANNUAL REPORT OF THE TRUSTEES OF THE COLUMBUS, O., WATER-WORKS. (Population in 1880, 51,647.)

THE water-works of these two cities of nearly the same population, which have had the benefits of a public water-supply for nearly the same time, are worthy of comparison.

The Lowell works were built in 1872 after plans of Mr. Joseph P. Davis, M. Am. Soc. C. E., and the supply was

intended to be taken from the Merrimack River by building a filtering-gallery on its banks. It was found that the river-water did not come through the gravel to a very great extent, and that most of the supply came from the land side. A direct connection with the river became necessary, and was made and provided with a filter-inlet which becomes choked with silt deposited by the water in freshets, and is, therefore, useless most of the time.

The Columbus works were built in 1870, taking water from a well on the banks of the Olentangy River. This giving insufficient supply, filter-basins were added to filter the river-water, but they choked with silt to such an extent that in 1877 other water had to be procured, and the experiment of a covered gallery a mile long through water-bearing gravel was tried and proved successful. In 1884 a branch was built at right angles to this gallery for about 3,000 feet, and, in 1885, another one 2,000 feet long was constructed. At the present time Columbus is supplied entirely with ground-water drawn from about two miles of underground conduit. It is to be regretted that in the interesting statements concerning these galleries and their yield in the report, no exact figures are given of the length of these galleries and their actual yield. This lack of exactness in the information contained in reports of most works is very annoying to persons who search through page after page for simple facts and figures which ought to be clearly and concisely stated, but seldom are. In this case the commissioners, the superintendent, and the civil engineer all speak of the increased supply, both total and proportional, from the new gallery, caused largely by superior methods of construction, but do not give a single statement of length, dimensions, or yield from which any person can verify their congratulatory remarks.

These two cities, it thus appears, began with the idea of getting their supply by percolation through a river bank. In both cases the plan failed, and in both the effort was made to filter muddy river-water with the result of failure in each case again. For further supply Lowell has taken river-water direct, while Columbus has developed a fine system of collecting-galleries for ground-water.

In both cities the water is pumped. Lowell pumps into a reservoir and Columbus directly into the mains. To do the work Lowell uses pumping machinery of 10,000,000 gallons daily capacity to pump 3,561,000 gallons a day, and Columbus has engines of 18,000,000 gallons daily capacity to pump 5,086,957 gallons a day, the annual cost of pumping being in Lowell \$9,777.57, and in Columbus \$14,238.51. The cost of pumping each 1,000,000 gallons was, therefore, in Lowell \$7.53, and in Columbus \$7.68. As the Lowell report does not give the cost of pumping machinery, no comparison can be made of the interest on the cost of machinery. The Columbus report has a very interesting and instructive tabular statement of the cost of constructing and operating their works in every branch for each of the sixteen years they have been in operation, from which it appears that the pumping-station and machinery have cost \$235,789.58. If a comparison of cost could be made it would be necessary to include in the Lowell plant their reservoir, which is 520 by 510 feet in dimensions and 20 feet deep.

The danger of laying a slope wall lining on a puddled slope was exemplified in this reservoir last year. Since its construction, thirteen years ago, the water had at no time been less than eleven feet in depth, until October, 1885, when it was determined to clean out the basin, and the water was drawn down seventeen feet in six days, and about one-third of the granite paving on three sides of the reservoir slid down into the bottom. The repairing of these breaches cost \$14,000.

Water is used more lavishly in Columbus than in Lowell, as the reports show that in the former city 3,582 services make way with 1,420 gallons each per day, while in the latter the 6,913 services use daily but 515 gallons each. Part of this discrepancy is probably due to the fact that in Lowell there are 1,421 meters in use, while in Columbus there are only 449, being twenty per cent. in the first instance, and 12½ per cent. in the second of the total consumers. A large part is unquestionably due to the custom which the Columbus superintendent says is prevalent in the city buildings, charitable institutions, and public schools of having "constant flow attachments" and letting the water run freely all the time, "in winter to prevent freezing and in summer to keep the water cold."

This looks very extravagant, and, no doubt, is so, but, after all, the burden on the citizens in consequence of it is not so heavy as the statement of the fact would indicate. By the system of supply (direct pumping) enough engine

reserve for fire-service must be kept constantly on hand, and a full crew of engineers and firemen must be on duty continuously. The extra cost of coal is therefore the only additional expense produced by increasing the consumption up to the practical limit of the machinery. The total cost of the coal used in Columbus was \$4,924.90 for pumping 1,856,000,000 gallons, while in Lowell the coal for pumping 1,300,000,000 gallons cost \$5,113.69.

Even with the great abuse of water privileges the Columbus consumers pay but little more than those of Lowell do, the average annual rate being \$22.18 in Columbus and \$21.98 in Lowell. The profit on the water furnished to consumers is also in about the same proportion in both cities. It appears from the figures given that the excess of revenue over operating expenses was, in Lowell, \$108,693, or \$15.72 for each consumer or tap, and in Columbus was \$53,626, or \$14.97 for each tap—that is to say, it cost the city about \$7 a year for the water for which they charged \$22. This is a pretty large profit to charge customers. There are, to be sure, other expenses which the city at large has to pay, amounting, in Lowell, to \$126,616 for extensions and interest on the debt, but the consumers have to pay their proportion of this sum the same as non-consumers, who get the benefit of the water-supply in decreased insurance and general betterment of property from the fact of there being a good water-supply in the city.

The exact amount contributed by taxpayers in Columbus cannot be obtained from the report, because no statement is given of the water debt of the city, or the interest paid—an omission much to be regretted. According to Croes's "Statistical Tables" the debt is \$772,000, at four to six per cent. interest, so that the amount of expenditure in excess of operating expenses was probably about \$88,000 last year. It does not seem fair that consumers should be compelled to pay, in addition to their share of this expense, and to the whole cost of the operation of the works, the sum of \$108,693 in Lowell, and \$53,626 in Columbus, or eighty-six per cent. in Lowell and sixty-one per cent. in Columbus of the entire cost of a great public benefit. It does seem as if in both these cities the rates ought to be adjusted so that the share of the expense contributed by property would be greater and that paid by individuals less. We commend this idea to the consideration of city officials and water consumers everywhere.

ESSAYS READ AT THE MASTER PLUMBERS CONVENTION.

We print below abstracts of three of the essays read at the Deer Park Convention of the National Association of Master Plumbers. We shall in later issues give selections from others:

PROGRESS OF PLUMBING.

ESSAY PRESENTED BY THE MASTER PLUMBERS' ASSOCIATION OF BOSTON AND VICINITY.

THE progress is slow, but markedly regular and intelligent. From time to time theories have been advanced by visionary sanitarians, whose careers, like their views, have been meteoric, but to the scientific writings of a few truly able men, and to the thoughtful, earnest efforts and skill of practical masters and journeymen belongs the credit of lifting the plumbing trade from a crude condition to a place in the foremost rank, until at present no branch of building construction is considered of greater importance or receives more conscientious attention. Well may we be pardoned self-gratulation that such is the fact. Otherwise the simile of the whitened sepulchre would have received an intensified exemplification in every edifice erected, for science has proven that from impure water, impure air, and different noxious gases come the germs of many of the most destructive diseases that afflict mankind. * * * It is gratifying to know that the honorable brotherhood here represented has been largely instrumental in effecting the better preservation of health, and, consequently, in augmenting the term, usefulness, and enjoyment of life. Let us briefly consider the means by which this great humanitarian reform has been brought to its existing degree of effectiveness, and those whereby it may be still further advanced toward perfection. The instinct that prompts men to provide themselves with shelter is common to every branch of the human race, and upon the height of civilization attained depends the design, convenience, and garniture of the structure for that purpose. In this favored land we build substantial dwellings of marble, stone, brick, and wood, and enshrine our Lares and Penates in temples of comfort. Unfortunately, until within a few years, certain appliances and devices, now considered absolutely indispensable to cleanliness and the purity of the atmosphere were held to be of only secondary importance, until the warnings of science, the experience of innumerable members of our craft, and the quick perceptions of the people caused a revolution, the scope of which was as wide and effectual as its suddenness was phenomenal. To the public demand for protection against the evil effects of bad drainage and ventilation, the plumbers were prompt to respond

by devising a system whereby fixtures were placed in any part of a building and so arranged that an ample flush of water so quickly disposed of sewage matter that no taint can be detected in the atmosphere. Moreover, progress in this direction has been such that by proper placing and fitting of sewer, waste, and drain pipes, and the use of large size flushing pipes and bowls in conjunction with a practical plan of local ventilation, a bath-room or water-closet may be put in any part of a dwelling without perceptible vitiation of the atmosphere. (After touching on the serious results of the increase of plumbing fixtures, etc., in houses, the essay proceeds.) Confronted with improvements of such a questionable character, is it to be wondered at that many begun seriously to consider the advisability of a return to the primitive accommodations of their ancestors—viz., out-houses and wash-bowls and pithers? At this state of affairs the real intelligence of the trade came to the front and induced legislation in most, if not in all, of our large cities, with the result that mandatory protective measures in this matter of drainage and ventilation were secured, which served as a foundation whereon has been built a system of plumbing so far in advance of that in vogue a comparatively few years ago, that no just comparison can be instituted between them; and by which all persons who are willing to comply with the law, and to pay a fair price for honest work honestly performed, can have their plumbing done in such sanitary perfection as to relieve them from all anxiety as to sewer-gas or any other mephitic dangers now universally acknowledged to be menaces to longevity, especially to the dwellers in great cities. Under the stimulus of important results already achieved, then let us, one and all, seek to maintain the high standard of our calling, and increase its usefulness by assiduous study of the various causes of its exercise. Perfection in its mechanical details, while greatly to be commended and encouraged, is yet too apt to be considered the chief desideratum, but unless there be a thorough insight into the elements and conditions which demand our aid no permanent good can be accomplished. Every member of our order should be familiar with the nature of the country, soil, and water in his immediate vicinity, and note with care every incident cognate to his interests, in order to form an intelligent opinion when called upon to exercise his function in any habitation. * * * To ascertain the purest possible supply, to know the best means of procuring the same, to be capable of its analysis, to understand drainage and ventilation, and all concomitant essentials should be the study of every plumber desirous of attaining that eminence which pride in his profession should inculcate. Our field is broad, our opportunities present and promising. By honest, constant effort the progress already made may be so accelerated as to leave nothing to be desired in the way of reputation and substantial emolument.

EDUCATION OF THE CRAFT.

PRESENTED BY THE PHILADELPHIA ASSOCIATION.

- (1) By a system of apprenticeship.
- (2) By trade-schools.
- (3) Which should come first: the education of the plumber, or sanitary legislation?

The time has come, and within the last few years, for the community to awake and recognize the duty it owes to itself by inquiring into the causes and effects of imperfect plumbing. We meet many who are disposed to follow in the footsteps of the past, adhering to the old adage that what is good enough for Mr. Smith is good enough for them; if any ill effects result from said imperfections, they are always ready to lay it at some other door. The remedy is to educate the people that they may know good plumbing from bad, and thus judge between imperfect and perfect sanitation. Then the demand will be, give us good mechanical and practical sanitarians, men who have combined the knowledge obtained by practice with that received from others. Practice and experience are silent teachers, and the tests which they can stand theorists fail in. Educate the people and our profession will be properly appreciated. * * * It was published in one of our sanitary journals that no one, not even a plumber, could become a sanitary engineer unless he had graduated from certain colleges. That assertion covers considerable ground, and we would ask, where did he who started the first college become a sanitary engineer? Many men, although self-taught, have surpassed those with a college education, but still a college or school for the purpose of giving instruction in certain branches is essential and of great aid to the student. There are in our profession those who have given from fifteen to thirty years' practical and mental study in their business, and that coupled with their theoretical knowledge, which has been tested in practice, make of them mechanical and practical sanitarians, or sanitary engineers of the highest order, without having served a few years in any school or college. The school which they have served in is the one which is open to the craft, and he that takes advantage of its teachings will master his profession. There was a time when the public was like the old farmer who had a son, whom he sent to school. One day he asked the boy if he knew how to spell "taters." The boy answered that he did, and commenced by spelling, "p-o-t-a-t-o-e-s." "Hold on!" said the farmer, "any teacher who will teach a boy to spell 'taters' with a 'P' don't know much; I guess you had better stay home." How many plumbers have met with that boy's experience when they tried to get their customers to ventilate and improve their plumbing. But the times are changing; the public is being educated; the beacon-light of knowledge although dim, its rays are brightening; the plumber is no longer considered a necessary evil, but a mechanic entitled to encouragement and

support, for pestilential disease has no foothold where his work is well done and his advice followed. The department of city governments are recognizing the importance of good work; the people are being educated; the plumber must necessarily be ahead of the people; he must know more than the people; he must be ready with his advice and the people must know whether it is good, bad, or indifferent; he must study; there is no rest for him; he must allow no one to surpass him in the knowledge of his business. The people work on theory; they are educating themselves; the plumber must put that theory into practice; he has the advantage; the people ask for information that the plumber would not think of; they are theoretical questions; the plumber must put them into practice. Thus the plumber or the craft becomes educated in all the different technical parts of the business. Now, then, educate the craft. How? By coming together as we have done in the form of associations. Have our sanitary committees discuss the different ideas presented; what one does not know the other one does; compare notes; let the community at large see that we do understand our business. In regard to apprentices much can be done to elevate the profession. The time was when the plumber's apprentice's idea of the business was the making of a joint, and that then he was a plumber; but it is not so now, and we should see to it that in engaging our apprentices we select only intelligent boys—boys who have obtained a good education. They cannot be too thorough, for much depends upon their knowledge, as it aids them in perfecting their trade, enabling them to calculate the capacity of and the lining of cisterns, making up material, calculating the grading of drain-work, the intelligent drawing of their plans, the causes and the reasons for doing work to meet the sanitary requirements. Teach them *not* to do work because some one else did it that way *without* being able to give a reason for the same. At this point comes in the trade-schools, if formed throughout the country, for in them the required instruction can be obtained which they are not able to receive in practical work—such, for instance, as the drawing of plans, the causes and results of vacuum-syphonage, the necessary sizes and lengths of anti-syphon pipes, together with innumerable questions and instructions. They are a powerful lever to elevate the plumbing business, and keep the plumber of the future abreast with the times. Let us look well to the education of the plumber in every detail of his business, for when that is accomplished we need not concern ourselves about sanitary legislation, for they both go hand in hand.

ARBITRATION AS A MEANS OF SETTLING DISPUTES.

PRESENTED BY THE NEW YORK ASSOCIATION.

- (a) WHAT class of questions should be submitted to arbitration?
- (b) Who should constitute a Board of Arbitrators, and how appointed?
- (c) The question applies to differences between manufacturers on the one side and master plumbers on the other, and between master plumbers on the one side and journeymen on the other.

First—What is arbitration? It is the adjudication by private persons appointed to decide a matter or matters in controversy, on a reference made to them for that purpose, by agreement of the disputants.

The arbitrator ought to be a person who stands perfectly indifferent between the disputants, and he requires no other particular qualification for the office; the choice by parties of the person, who, they agree, shall decide between them ought to be untrammelled.

Where there are two arbitrators in case of difference of opinion the matter is referred to be decided by a third person, called an umpire, selected or appointed by the arbitrators themselves, and invested with all their powers, whose judgment is final; the latter form would be, to our mind, the very best means of settling very many of the disputes between capital and labor to-day. We hear sometimes that it is an irrepressible conflict; it is not so. Labor is the foundation of all, ever since our first parents fell. Capital! what is it but the accumulation of labor? The interests are mutual; there should not be antagonism that arbitration could not adjust. The very spirit and feeling that suggest arbitration are the best evidence of the benefits to be derived from it.

What class of questions should be submitted to the arbitrator? We think all questions between capital and labor—or, in other words, between the employer and employee—might very justly be submitted to arbitration, save one, and that is the unalienable right of the employer to say who shall or shall not be in his employ. That question is beyond the pale of arbitration, and no strike, lock-out, or any other means of adjusting grievances, undertaken to pass upon it, should be tolerated or listened to. Employees should themselves see that it is denying a right to their employers that they themselves possess. All other questions—hours, wages, etc.—can properly come under arbitration.

The next question, "Who Should Constitute a Board of Arbitrators and how should they be appointed?" admits of a great variety of opinion. Unbiased decisions are the great desideratum, and how to appoint, or who should constitute a Board of Arbitrators is a very difficult question to answer. In our view, both parties should have the selection of one of their own number, they to select an umpire with all their powers and privileges, and he should be by all means above suspicion. Then, a righteous, or as perfectly just award as possible may be made, and in all cases (without the strongest proof otherwise) this award should be final.

The last subdivision of the subject applies to differences between manufacturers and master plumbers, also to those between master plumbers and journeymen.

As between the manufacturer and the master plumber, there should be some honorable and straightforward protection, first of all, before there can be any arbitration or anything to arbitrate about. As master plumbers, we cannot shut our eyes to the facts staring us in the face—that of any trade or profession we know of, this is the most poorly protected, or is not protected at all, and in its results the most pitiable when you think of the wear and tear, the intelligence, education, and energy you must possess, notwithstanding the popular idea that there are millions in it; and I venture to say that 75 per cent. or more of the men within the sound of my voice never reached the means they possess solely and exclusively through the prosecution of the plumbing business. The same intellectual and mechanical energy displayed in any other pursuit or business would have made many of us the "Vanderbilts" or "Rothschilds" of our day and generation.

But to return from this digression, I think you will concede that there can no difference arise between us and manufacturers that arbitration cannot adjust.

Between employer and employee we have faintly suggested how to accomplish arbitration final and binding on all parties.

Correspondence.

QUESTIONS ON STEAM-APPARATUS.

MANCHESTER, ENG., June 21, 1886.

SIR: (1) Please let me know your experience of the blacking of walls of rooms by the radiators and the cause of it?

(2) What distance should radiators be placed from a wall to prevent blacking?

(3) Does low-pressure steam pass the insurance companies?

(4) Has fire taken place from steam-pipes, and at what pressures and temperatures?

(5) How close can pipes be put to the wood-work safely?

(6) Which is the most approved plan for making wood safe?

(7) Do the tubes of multi-tubular boilers last, and how long?

(8) What strength of tubes do you generally use in American practice?

(9) Does the automatic water-feed answer well, and are they to be recommended?

(10) Is the damper-regulator generally adopted, and is it successful in American practice?

(11) Is the bottom in the Dunning boiler sufficiently high to prevent a deposit from burning the lower ends of the tubes?

(12) Are air-pipes generally run to radiators, or are they run to only the Marsh air-valve?

(13) Have you any buildings that will average 45,000 cubic yards contents, warmed to 70° Fah., and what is the method usually adopted?

(14) Who makes the best boiler front?

Kindly reply to these questions, and oblige yours faithfully, W. W.

[The walls in the buildings in New York City, or any part of the country where anthracite coal is burned almost exclusively, do not become black or seriously discolored behind radiators. In the city of Pittsburg, Pa., and other places where there is much smut in the air from many manufacturing places that burn soft coal, the walls always become black back of the radiators if they are close to the wall. The cause of it is understood to be the rapid deposit of smut from the air by the circulation of the warmed air against the walls. The air rushing to the heater gathers the light black dust from the floor, in addition to what it holds in suspension, and deposits it on the walls as it rises, leaving, as it were, the dust of ages on a patch of the wall from a season's use.

(2) No ordinary distance between the wall and radiator will prevent it in Great Britain, but a painted wall behind the heater might obviate the trouble to a considerable extent, as the smut could be sponged off when it became objectionable.

(3) All ordinary pressures of steam will pass the insurance companies, say from 90 lbs. per square inch down, if the requirements of the fire underwriters are complied with.

(4) There is much circumstantial evidence that steam-pipe will ignite wood or woody fibre.

(5) The New York Board of Fire Underwriters require one inch between the pipe and wood-work, and require the latter covered with sheet-iron or tin nailed on.

(6) Tin, sheet-iron, or zinc nailed on the wood, and guards of iron, with not less than one inch air-space between, so arranged that the pipe cannot be pressed against the wood-work or sheet-metal covering it, makes wood-work reasonably safe.

(7) The tubes of horizontal multi-tubular boilers with anthracite coal will last twenty years and over if otherwise taken care of when used for gravity apparatus. When they are used with soft coal and poor water continually fed into the boiler, their life is variable—from four or five years to twenty. They are about the same for upright boilers, the conditions being the same; but it frequently happens that the upper ends of the tube become burned where they pass through a steam-space from hard firing, but to last twenty years is nothing uncommon for a heating-boiler.

(8) American boiler-tubes of $1\frac{1}{2}$ -inch outside diameter, are of No. 14 Birmingham wire gauge, for 2 and $2\frac{1}{2}$ inch No. 13, for $2\frac{3}{4}$ and 3 inch No. 12, and for larger sizes No. 11. They are capable of withstanding a collapsing pressure very much in excess of any ordinary boiler-pressure when unimpaired in thickness by rust or erosion.

(9) The automatic water-feeder obtained from reliable makers does very well. Should it get out of order it will allow water to leak into the boiler, and, therefore, make the boiler too full.

(10) There are many makes of damper-regulators that are reliable, and no well-arranged apparatus here will be without one.

(11) We have never heard of a complaint of this kind from the Dunning boiler. With a gravity apparatus there will be no practical deposit, as the same water is used over and over again for six months or a year, and the daily addition of fresh water is so small that it can make no appreciable deposit.

(12) It is the custom to run air-pipes to all automatic air-vents, as there are times when they will pass a little water.

(13) There are very many buildings containing from one to two million cubic feet of air-space in New York City heated by steam, usually by direct radiation when for commercial purposes or domiciles (apartment-houses), and indirect radiation when for institutions.

(14) The question of the best boiler front is very difficult to answer, as each maker thinks his own the best, and as each may have good points for a special purpose.]

STEAM-TRAP ON COILS FOR HEATING VATS.

BOSTON, MASS., June 25, 1886.

SIR: We have two or more vats, 5 feet long, $4\frac{1}{2}$ feet wide, and 2 feet deep; on the bottom of each of these there is a line of 1-inch steam-pipe (brass) supplied with live steam (70 pounds). We desire to save the condensation, which amounts to about one gallon a minute or more, and put the same into a tank about 25 feet overhead. Which is the best way to do it, and what is the best kind of a trap to use? Is there any objection to attaching more than one vat to each trap? Would both vats boil equally as quick? Each vat has a supply of its own. A reply through your columns will greatly oblige, Yours respectfully, "STEAM."

[The most desirable and the only immediate practicable way to accomplish what you wish to is to use a Nason trap of suitable size on each vat.

These traps will receive the water of condensation and will elevate it two feet (theoretically) in discharging for each pound of steam-pressure in the coil. This is more than should be looked for in practice, but there is no doubt that seventy or even a much lower pressure of steam will discharge these traps to a tank twenty-five feet above. The trap should be set below the coil, so the water of condensation will run into it, and the discharge-pipe should go as near perpendicularly upward as possible, until it got above the 25-foot level, when it may turn and run slanting downward to the tank. Small diameter discharge-pipes under these conditions do best, as they hold less water to run back into the float when the pressure runs down. The upper end of the discharge should not dip into the water in the tank, as it will form a syphon and run the water back at times. A separate trap and a separate discharge-pipe should be used for each vat and coil to get the best results, as the discharge from one trap is apt to start the others before they are full. We do not understand whether the gallon per minute is from each vat or from the whole collectively. In any case take the water discharged in pounds per hour and multiply it by four and it will give you the rating in square feet of ordinary heating surface that a Nason trap, per catalogue, will drain. Thus, one gallon per minute (7.5 pounds) $\times 60 \times 4 = 1,800$ square feet, which will call for a No. 4 trap. Or, if this represents the water from two coils or vats, two No. 2 traps.]

PAYING FOR WATER USED BY A GRAVITY HEATING-APPARATUS.

SOUTH BETHLEHEM, PA., June 23, 1886.

SIR: The other day a friend of mine, having in one of his buildings a gravity-return apparatus, inquired of me why he was taxed to the sum of \$10.50 per year for water for the same. He says the charge for a water-closet is not more than one-third of the above; so, considering the amount of water used by a water-closet to that used in his heating-apparatus, he thinks the charge very much out of proportion. So, with the desire to receive some information upon this matter, I submit the same to you, hoping, through your columns, to find your opinion in the near future. With thanks for past favors in the correspondence columns, I remain, Yours respectfully,

H. A. R. D.

P. S.—I am much pleased with your "Steam-Heating Problems."

[We presume the water company base the rates on supplying water for a boiler of a certain horse-power per annum—say two or three dollars per horse-power per year—not knowing that the water from a gravity heating-apparatus is used over and over again, and the waste comparatively nothing with a properly arranged apparatus. However, they have to put their rates sufficiently high to protect them against mismanagement, and, consequently, we see no way out of the difficulty except for your friend to ask the company to give him a meter and sell him water by the 100 or 1,000 gallons at an equitable rate. Then it will be fair to both parties.]

Novelties.

Under this heading we propose to describe and illustrate appliances of probable interest to our several classes of readers. The selection will be made without reference to the wishes of agents or patentees, being governed solely by considerations of novelty, ingenuity, and probable interest to readers, and especially the fact that they have not been elsewhere described. As a rule we shall make no comments, and it is to be distinctly understood that a notice does not imply approval. No charge will be made for these notices, and any offer of pay for their insertion will insure their omission. We shall be glad to have our attention called to novelties suitable for this section.

ELECTRIC FLUSH FOR WATER-CLOSETS.

The accompanying illustrations show a novel flushing apparatus for water-closets, etc., recently patented by Mr. A. A. Barker, architect, of 425 Main Street, Worcester, Mass.

Its principal feature is the governing and control of the water-flush by electricity. Figure 1 shows its general application to a closet, A being the cistern which is operated

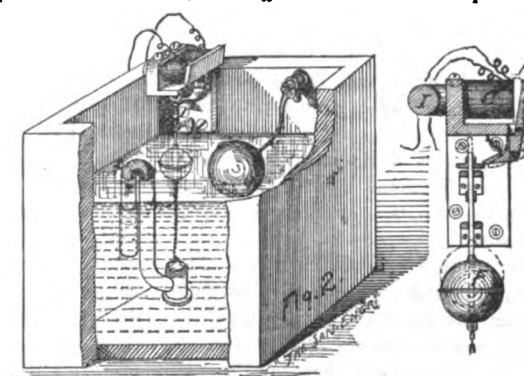
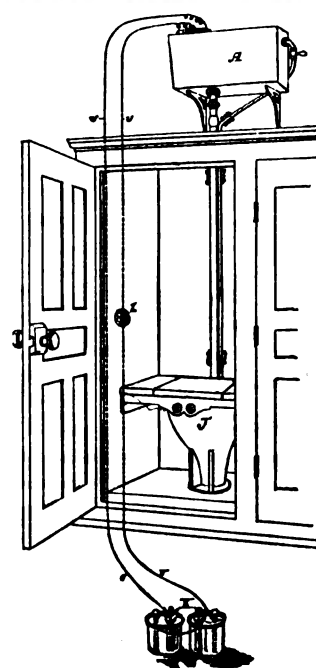


FIG. 1.



by electricity, J the hopper or closet flushed, K a battery, *v v* the wires, and I a push or "call" button, similar to that used in any circuit-closer. Figure 2 is a perspective view of an ordinary flushing tank or cistern, with the electric apparatus—coil, magnet, and armature—which relieves the float connected with the flushing-valve, allowing enough water to pass into the syphon to charge it, and Fig. 3 is a detail of the magnet armature and trip mechanism. When the button is pressed by a person requiring the flush, the current of electricity passes through the coil C, making a magnet of the soft iron bar I when the armature A is drawn to it, as shown by the dotted lines, liberating the float F, which draws the valve from the seat, admitting the water to the syphon. An adjustable tube on the short slip-tube on the end of the syphon regulates the amount of flush, and a hinge on the trip-toe of the armature allows the stop on the float-rod to pass below it when the water falls. Slackness in the chain between the float and the valve allows the latter to seat properly when the stop is engaged with the trip-toe. Further details can be gleaned from the drawings.

Gas and Electricity.

Illuminating Power of Gas in New York City.

Week ending	New York Gas-Light Company.	Manhattan Gas-Light Company.	Metropolitan Gas-Light Company.	Mutual Gas-Light Company.	Municipal Gas-Light Company.	Kickerbocker Gas-Light Company.	Equitable Gas-Light Company.
July 3....	26.85	22.47	21.64	20.70	29.84	22.76	31.46

E. G. LOVE, Ph.D., *Gas Examiner.*

REPORT OF THE UNDERGROUND WIRE COMMISSION.

MR. ROSWELL P. FLOWER, of the commission on placing electric-wires underground in this city, has prepared an elaborate report on the subject, which has been signed by his colleagues. The commissioners have asked for proposals to undertake the work of putting the wires underground, and express the hope that a beginning will be made by September.

We abstract portions of the report :

"Nearly 150 plans and models have been submitted to the commission, including ten tunnel systems, ten conduits formed from iron tubes or sections, twenty conduits formed from concrete, wood, or masonry; twenty sidewalk or gutter systems, twelve permanently imbedded wire systems, and twelve cables and insulating compounds. Five general systems as to mechanical construction exist for subways—the tunnel system, the "drawing-in" system, the solid system, the "dropping in" system, and the combined system.

"Tunnel systems, or those where space is provided underground sufficient to allow the passage to and fro of men who place the wires within the subway, could be recommended were unlimited time and money at the disposal of the commission; but the expense of such a system and the crying need of immediate action preclude the adoption of such a plan.

"Drawing-in systems, or those where manholes are provided in the streets, connected by tubes or pipes through which the wires can be drawn, are next in prominence and convenience to tunnel systems.

"Leaving out of consideration all tunnel systems as too expensive, we must also discard any system which calls for the simple laying of insulated cables in the earth. They would not stand the chemical action of the gases and acids: the streets would be continually torn up for new connections and repairs. We are thus shut up to the question of electric subways or conduits in which the wires or cables, insulated or otherwise, must be placed, and which once laid down should meet all the demands of the present and near future.

"Of conduits it may be safely predicted that, so far as the experience of this and other cities is a test, some form or other of a 'drawing-in' system is most convenient. The life of the best cable is by no means satisfactorily decided, and, of any particular cable to predict how long it would last would be purely speculative. Of wires not contained in cables it may be said that they are equally or more uncertain in their length of life and usefulness. At all events, for purposes of distribution it is desirable that the wires should be easily approached at frequent intervals, and the

commission cannot countenance any plan that looks to the disturbance of pavements more than is absolutely necessary. It may be that through lines of wire would be better protected laid in permanent beds of insulating material, but a 'drawing-in' conduit system allows space to be provided for new wires without the frequent tearing up of pavements. The commission can therefore give their approval to a 'drawing-in' system with frequent manholes as the general form of subway best adapted to meet the requirements of the electrical service of the present.

"Any kind of conduit which will protect the insulated wires will answer; on the other hand no known conduit has yet been found which works perfectly, or is an ideal one. It may be said with confidence that the weight of evidence before the commission is toward the use of an insulating material for conduits, and of insulating materials, asphalt or bituminous concrete has certain advantages over all others—viz., it is cheap; it is durable; it is capable of standing harsh treatment; it can be easily and closely jointed; it can be made absolutely free from moisture and free from contraction and expansion; it is a bad conductor of heat as well as electricity.

"It is the part of the commission to secure to the best of their information and belief the best and most convenient protection for the wires, and it is believed that this can be secured in an asphalt concrete 'drawing in and out' conduit, and that in the material decided upon all the advantages known to exist in any system can be successfully combined. But in the same way as it has been said that for particular purposes or particular localities it may be necessary for the commission to depart from the drawing-in system, so it may be said that it may be necessary for them at times to depart from the asphalt concrete material. Iron pipes have two distinct advantages over the asphalt concrete which are indisputable. They are stronger and they are less bulky. If for special reasons extraordinary strength or compactness is preferable at special points to durability and insulating properties and cheapness, then the commission can at those points be compelled to modify their plan to suit the exigencies of the case and use iron."

The commission has adopted the following resolutions among others :

"Resolved, That the commission, in view of all the information they have been able to acquire on the subject, favor a subway which shall in the main conform to the following conditions: Its material shall be an asphalt or bituminous concrete, which shall be capable of sustaining the following tests: It should sustain a crushing test of 4,000 pounds per square inch, and have a tensile strength of not less than 300 pounds per square inch of section; it should not crack when subjected to a temperature of 10°, nor lose its shape at 200°; it should not soften below 160°; it should resist the action of organic acids and illuminating gas, and should not disintegrate under the action of salt water; the pitch or asphalt used should be inspected before it enters into the concrete, and be pliable at 150°, but brittle below that temperature. It should not be heated above 325° in boiling; the sand used should be silicious, and the porosity of each lot carefully determined so as to insure the perfect cohesion of the mass, with no excess of plastic material. But this shall not prevent the use of any other material where the special exigencies of particular electrical services or of particular localities render it advisable in the opinion of the commission. Its form shall in general be that of a conduit, with convenient manholes where cables and insulated wires may be readily drawn in and out of distinct ducts in the conduit; but this shall not prevent the laying of wires in other ways where for special reasons it may seem desirable to the commission."

A report will be made to the commission by its mechanical expert on the data he has collected as to the elaboration of the plan necessary in providing for different classes of wires and the mode of distribution best adapted to the wires of different electrical services, and the engineer will report upon the capacity of conduit required for different classes of wires in different parts of the city, and the order in which different parts of the city can be most conveniently supplied with subways.

THE Board of Aldermen of Hartford, Conn., has empowered the Board of Street Commissioners to contract with the Hartford Electric-Light Company to substitute for all gas-lamps electric-lamps. It is promised that a reduction in the cost of lighting will result.

Reviews of Books and Pamphlets.

FIFTH ANNUAL REPORT OF THE STATE BOARD OF HEALTH OF NEW YORK. 481 pp., 8vo. Albany. 1885.

This report is for the year 1884, having been transmitted to the Governor April 9, 1885, and thus appears in complete form over a year after the date of its preparation.

The report itself, however, and a large number of the appended documents, have been issued from time to time as distinct pamphlets, and have been duly noticed in THE SANITARY ENGINEER. The special feature of this volume which distinguishes it from the reports of all other State Boards of Health is the number and character of the special reports on the sanitary conditions of various localities, with recommendations as to means of improvement, especially from the engineering point of view. The board divides the cases in which it has made examinations and given advice into five classes, as follows :

First—Cases where the State is alleged to be maintaining a nuisance on its property, or where State works have so interfered with channels of natural drainage as to cause a nuisance. In these cases the aim of the board is to furnish a reliable basis for remedial legislative action, where such action is proper and necessary, and at the same time to protect the State from unjust demands made by localities.

Second—Cases in which the board is called upon to supervise the plans and execution of sanitary work ordered by the Legislature.

Third—Cases in which localities appeal to the board for protection against injuries to health produced by the construction or operation of railroads or large manufactories.

Fourth—Cases in which the board is called upon to investigate the alleged influence of the acts of one town upon the health of citizens of another, more especially by the disposal of sewage, the obstruction of subsoil drainage, or by the contamination of water-supplies. In the matter of the drainage of the great swamps of the State, which are estimated as having an aggregate acreage of over two hundred thousand acres and as producing much illness, the board recommends that the State loan to localities the sums necessary to execute the drainage-works, the plans for such works to be approved by the State Board of Health. This is the English system.

Fifth—Cases in which local authorities ask the advice and assistance of the board in sanitary matters, where the citizens desire advice from a competent and impartial authority. The board declares that it is not its purpose to make detailed plans for the sewerage and drainage of localities where the State has no responsibility for the insanitary conditions, but that it will endeavor to assist in determining in a preliminary way as to the necessity for such works, and as to what their general character should be, leaving the community to select its own engineer and to make its own plans. Twenty-nine special reports relating to one or other of the above-mentioned classes are given in the appendix, most of these being illustrated with maps and all being instructive, although, of course, being chiefly interesting to the individual communities to which they relate. Among these are reports on the sewerage of Peekskill, Saratoga Springs, Malone, Mt. Vernon, and Kingston, a plan for the drainage of the Chemung Canal prism near Elmira, a report on nuisances at Martinville in the city of Albany, a report on the drainage and sewerage of Hoosac Falls, etc., etc.

While we are not able to agree to the wisdom of some of the recommendations as to sewerage and house-drainage made by the engineer of the board, there can be no doubt that the work done by the board in this direction has in the main been good and has exercised a strong and much needed stimulus to sanitary work in certain localities, while the publication and distribution of these reports can hardly fail to influence in the right way some of the many towns and villages in the State which at present are in a state of comparative barbarism as regards methods of disposal of excreta and of water-supply.

The total expenditures of the board for the year amounted to \$21,971.36, and we should think it was money well spent. The board states that the regular appropriation of \$20,000 barely suffices to defray the expenses connected with the registration of the vital statistics of the State; and that if it is to continue the work of inspections, of suppression of effluvia nuisances, etc., the necessary funds must be provided.

The report, taken as a whole, is highly creditable to the board, which has reason to be satisfied with the results thus shown for the moneys expended by it.

Association News.

AMERICAN SOCIETY OF CIVIL ENGINEERS.

THE special train for the Eastern members who are attending the convention of the society at Denver, Col., last week and this left New York City on the morning of June 29, arriving in Chicago the following day. From a member en route we have received the following notes of progress up to the time of leaving Chicago: "We were met by a number of members on the way, Mr. Theodore Voorhees, Superintendent of the H. R. & N. Y. Central to Poughkeepsie; Mr. Reece, of the Lake Shore, and here (Chicago) Mr. D. J. Whittemore, former president; Mr. Merrill, of the C. B. & Q.; Mr. Morehouse, Secretary of the Western Society of Civil Engineers, and Mr. Strobel, who escorted the party to several points of interest during the four hours' waiting for the C. B. & Q. train. Everything bids fair for a large and interesting convention. The train thus far has consisted of four Pullman and Wagner cars, to be increased here to five. The speed to Buffalo averaged, including all stops, 42 miles per hour, and to Chicago 39 miles per hour. But the stops on the latter portion were very considerable. The speed often reached 55 to 60 miles." There were on the train when it reached Chicago the following members and guests: William F. Booth, Poughkeepsie, N. Y.; A. Bonzano and Mrs. Bonzano, Phoenixville, Pa.; Hubert Bonzano, Phoenixville, Pa.; John Bogart and Mrs. Bogart, New York City; Thomas S. Bishop, New Britain, Conn.; Andrew Bryson, Brooklyn, N. Y.; William B. Cogswell and Miss Cogswell, Syracuse, N. Y.; F. Collingwood, Elizabeth, N. J.; Eliot C. Clarke, Boston, Mass.; L. E. Chapin, Toledo, Ohio; S. B. Downes, New York City; Joseph P. Davis, New York City; R. Fletcher, Hanover, N. H.; C. A. Ferry and Mrs. Ferry, New Haven, Conn.; Clark Fisher, Trenton, N. J.; C. E. Greene, Ann Arbor, Mich.; C. E. Goad, Montreal, Canada; E. B. Guthrie, Buffalo, N. Y.; William G. Hamilton, New York City; Charles A. Hinckeldeyn, Imperial German Legation, New York City; William J. Haskins, New York City; William R. Hutton, Mrs. Hutton, and Miss Hutton, New York City; William A. Jefferis, New York City; George A. Kimball, Somerville, Mass.; Thomas B. Lee and Mrs. Lee, New York City; Thomas C. Meyer, New York City; D. E. McComb, Washington, D. C.; Charles Macdonald and Mrs. Macdonald; Mrs. Henry G. Morris, Philadelphia, Pa.; Albert F. Noyes, West Newton, Mass.; Frederick S. Odell, New York City; William H. Paine and Mrs. Paine, New York City; Franklin C. Prindle and Mrs. Prindle, East Orange, N. J.; William Roberts and Mrs. Roberts, and Mrs. John Hulbert, Waltham, Mass.; T. F. Richardson and Mrs. Richardson, Boston, Mass.; Joseph R. Richards and Mrs. Richards, Boston, Mass.; R. W. Ryan, New York City; George F. Swain, Boston, Mass.; Pemberton Smith, Buffalo, N. Y.; Stevenson Towle, New York City; The Misses Towle, New York City; A. W. Trotter, New York City; Mrs. Trotter, New York City; John G. Van Horne and Mrs. Van Horne, Jersey City, N. J.; Miss Van Horne, Jersey City, N. J.; A. M. Wellington and Mrs. Wellington, New York City; William H. Wiley, Mrs. Wiley, and Miss Wiley, New York City; Charles D. Ward and Mrs. Ward, Jersey City, N. J.; F. W. Watkins and Mrs. Watkins, New York City; William Watson, Boston, Mass.; Montgomery Waddell, New York City; James R. Wardlaw, New York City.

From Denver we receive the following additional particulars from our correspondent:

"We arrived here on time at seven o'clock this morning (July 2), mountain time, with seven cars comfortably filled (about 120 strong), and some here in advance. We had a thoroughly enjoyable trip here, with no mishaps. The sessions opened at 3 P. M., July 2, but all addresses will be given this evening by the Governor of the State, the Mayor, and the President of the Chamber of Commerce; also, the annual address by the president of the society. A paper by R. M. Hoxie, of Washington, on 'Excessive Rainfalls,' was read and fully discussed by a number of the members. Tomorrow morning a ride will be taken around the city and sessions held afternoon and evening."

The following persons were on the train when it reached Denver, in addition to those above mentioned: H. T. Bliss and Mrs. Bliss, La Crosse, Wis.; Edward Baumann, Mrs. Baumann, Mr. Baumann, Jr., and Miss Baumann, Chicago, Ill.; William R. Belknap,

Louisville, Ky.; Mendes Cohen, Mrs. Cohen, and Miss Cohen, Baltimore, Md.; D. W. Cunningham, Grandin, Dak.; Howard N. Elmer, St. Paul, Minn.; E. W. Eckert, Massillon, O.; R. Hering, Mrs. Hering, and Master Hering, Chicago, Ill.; H. V. Hinckley and Mrs. Hinckley, Topeka, Kan.; T. W. Walker, Pittsburg, Pa.; Miss Bessie O. Hinckley, Topeka, Kan.; F. B. Howard, Detroit, Mich.; Thomas C. Keefer, Mrs. Keefer, and Miss Keefer, Montreal, Can.; W. H. Lotz, Mrs. Lotz, and Miss Lotz, Chicago, Ill.; John J. McVean, Iona, Mich.; H. G. Morse, Youngstown, O.; T. W. Walker, Pittsburg, Pa.; John Nichol and Mrs. Nichol, Chicago, Ill.; Henry Blabbuer, St. Louis, Mo.; H. A. Swenson, St. Paul, Minn.; George S. Emerson, Rolla, Mo.; Henry Flad, St. Louis, Mo.; Carl Gayler, St. Louis, Mo.; J. B. Johnson, St. Louis, Mo.; M. L. Holman, St. Louis, Mo.; R. E. McMath, St. Louis, Mo.; J. W. Meier, St. Louis, Mo.; Robert Moore, St. Louis, Mo.; Thomas J. Whitman, St. Louis, Mo.; C. M. Woodward and Mrs. Woodward, St. Louis, Mo.; Y. Wada, Topeka, Kan.; James H. L. Aulls, Omaha, Neb.; Charles Blackwell and Mrs. Blackwell, Omaha, Neb.; John F. Barnard, St. Joseph, Mo.; Clifford Buxton, Mrs. Buxton and Miss Buxton, Toledo, O.; J. James R. Croes and Miss Croes, New York City; W. Card, Pittsburg, Pa.; O. Chanute, Kansas City; Mr. and Mrs. De Funiak, Louisville, Ky.; Mr. and Mrs. Doane, Crete, Neb.; E. Dickinson, Denver; H. H. Filley, Mexico, Mex.; S. Waters Fox, St. Joseph, Mo.; B. H. Greene and Mrs. Greene, Helena, Mont.; G. S. Greene, Jr., and Mr. Carlton Greene, New York City; H. F. Juengst, St. Joseph, Mo.; G. W. Kittredge, Zanesville, O.; W. S. Lincoln, St. Louis, Mo.; Charles Latimer, Cleveland, O.; M. W. Mansfield and Mrs. Mansfield, Indianapolis, Ind.; G. B. Nicholson, Cincinnati, O.; John F. O'Rourke, Prairie Du Chien, Wis.; W. W. Rich, Turtle Lake, Wis.; A. Rosewater, Omaha, Neb.; David Reeves and Mrs. Reeves, Philadelphia, Pa.; George S. Rice, Georgetown, Col.; N. C. Ray, Omaha, Neb.; Robert B. Stanton, Denver, Col.; John F. Wallace and Mr. Wallace, Keithsburg, Ill.

NEW CATALOGUE.

THE POND ENGINEERING COMPANY, of St. Louis, Mo., has issued a pamphlet entitled, "A Brief Treatise on Water-Works." Aside from brief descriptions of ancient and modern pumping machinery, it contains some interesting information in regard to water-works and water-works systems. It also contains tables showing weights of standard water-pipe and friction of water in pipes, and pressures required at nozzle and at pumps for fire-streams.

Notes.

For works for which proposals are requested, see also the "Proposal Column," pages 125 and 126.

CONSTRUCTION.

PLANS WANTED. — The Board of State House Commissioners for the State of Kansas will receive competitive plans for the completion of the central portion of the State House at Topeka, Kan., on January 4, 1887; the plans to consist of first, second, and mezzanine floor plans, south and east elevations, and transverse and longitudinal sections, to a scale of eight feet to an inch. The Board of Commissioners will pay \$3,000 for the best plans submitted, and \$1,500 for the second best; the plans for which premiums are awarded will become the property of the State of Kansas, with the right to use the whole or any part or any modification thereof without further claim from the authors for compensation or employment. Estimates of the cost of erecting and finishing the building must accompany each plan submitted. E. B. Allen, Secretary of the Board.

HAMILTON, ONT. — We have noticed the fact that this city asks for proposals for furnishing pumping-engines. On June 28 the City Council decided that the terms should be so altered that instead of the steam-pressure being restricted to eighty pounds, the tenderer will be left free to propose any duty with any piston speed and any steam-pressure in the boiler.

MONTREAL, CAN. — The Finance Committee has voted an extra appropriation for the intercepting sewer. The estimate is now \$165,000.

NEW YORK. — The Underground Wire Commission gives notice that proposals for the construction of conduits for electric-wires will be received. It is believed that everything will be in readiness by August 12, to begin constructing the conduits.

BARABOO, WIS., will build water-works. The contract has been let.

FRANKFORT, KY. — Proposals will be received until 7 P. M., July 13, by the City Council, for steam-heating apparatus, pipes, radiators, etc., for school building now being erected in South Frankfort, containing sixteen rooms, 25x32 feet; halls, 14 feet; exhibition rooms, 51x52 feet. Address F. V. Gray, City Clerk.

ELLSWORTH, ME. — The citizens of Ellsworth have voted to instruct the city government to contract with the Ellsworth Water Company or any other water company for a system of water-works.

SARATOGA SPRINGS, N. Y., will extend its main sewer, and L. H. Cramer, engineer for the Board of Sewer Commissioners, asks for proposals until July 13.

LAKE LINDEN, MICH., will spend \$30,000 for water-works.

WATER-WORKS WANTED. — The city of Wabash, Ind., wants water-works. Proposals will be received until July 26. See our Proposal Column.

BROOKLYN, N. Y. — At a meeting, July 1, the Supervisors of Kings County decided to advertise for proposals for doing all the work at the St. Johnland County Farm. The contracts will amount to about \$200,000.

CINCINNATI, O. — The following additional bids have been awarded by the Trustees of the Hamilton County Court-House, Cincinnati: Carpets and linoleum, the John Shillito Co., \$8,448.77; awnings, to same, at \$5.70, aggregating about \$1,293; shades, George F. Otte & Co., \$599; frescoing, the Robert Mitchell Furniture Co., \$12,314.

The Trustees of the Garfield Statue Fund, Cincinnati, desire proposals for furnishing a pedestal of granite or similar material for the bronze statue of Garfield now completed, to cost not more than \$5,000. The statue is to stand in Garfield Place, at the intersection of Eighth and Race Streets, the site now being prepared by the city authorities.

BOSTON, MASS. — Proposals for excavation and the laying of the foundation-wall of the first section of the new court-house were opened by the Court-House Commissioners at their office in Pemberton Square, July 2, as follows: Sylvester & Rowe, \$29,704.96, will complete December 1; Sidney Smith, \$29,000, August 30; Sidney Smith, \$27,000, September 30; Sidney Smith, \$24,000, October 30; Benjamin F. Dewing, \$24,780; Woodbery & Leighton, \$23,412, November 1; Whidden, Hill & Co., \$23,000, September 15; Patrick Grace, \$22,825; Michael Meehan, \$22,500, September 21; C. A. Dodge, \$21,998; D. H. Cram, \$18,990, November 1. No award of the contract was made.

PHILADELPHIA. — Proposals were opened at the Fire Department July 2 for two new steam fire-engines, and the following bids received: The Clapp & Jones Manufacturing Company, of Hudson, N. Y., two 7,000-pound engines, \$8,500; the La France Fire-Engine Co., of Elmira, N. Y., two 7,000-pound engines, with the Prunty relief-valves, \$4,200 each, without the relief-valves, \$4,000 each. The Silsby Manufacturing Company bid \$3,300 for one engine of 7,000 pounds weight; the Button Fire-Engine Co., of Waterford, N. Y., bid \$4,200 for one or \$7,000 for two, and the same company offered to build one 8,000-pound double pump-engine for \$4,000 or one 7,000-pound and one 8,000-pound engine for \$7,000.

BROOKLYN. — On July 2 bids were opened for furnishing cable-driving plant for the bridge over East River. Engines of 600 horse-power will be required. The bidders were: For the engines complete—William Wright, Newburg, N. Y., \$14,910; Dickson Manufacturing Co., Scranton, Pa., \$18,150; Phoenix Iron Co., Trenton, N. J., first proposal, \$17,350; second proposal, \$17,900; Hewes & Phillips Iron-Works, Newark, N. J., \$17,500; Southwark Foundry and Machine Co., Philadelphia, Pa., first proposal, \$18,150; second proposal, \$23,450; third proposal, \$25,700; Buckeye Engine Co., Salem, O., \$19,000; Fishkill Landing Machine Co., Fishkill-on-the-Hudson, N. Y., \$21,300.

For the remainder of the plant complete—Southwark Foundry & Machine Co., Philadelphia, Pa., \$17,836.25; Phoenix Iron Co.,

Trenton, N. J., \$26,390; Poole & Hunt, Baltimore, Md., \$27,815; Dickson Manufacturing Co., Scranton, Pa., \$28,110.

HARTFORD, CONN. — Bids were opened July 1 for constructing the addition to the State prison as follows: Hiram Bissell, \$258,000; Barrett Brothers, \$255,000; D. J. Curtis, of Springfield, \$208,000; John C. Mead, \$190,000. The bid of Mr. Mead being the lowest, he will receive the contract.

NEW YORK. — Bids for completing the Twelfth Regiment Armory, Ninth Avenue and Sixty-second Street, were received on June 29 as follows: For carpenter and mason work, plumbing and steam-fitting, Mahoney Bros., \$9,582; Moran & Armstrong, \$9,943. Gas-fixtures, Mitchell, Vance & Co., \$6,175; Archer-Pancoast Manufacturing Company, \$6,040. Iron-work and gates, A. R. Whitney & Co., \$3,250; Manley-Cooper Manufacturing Company, \$2,300; Charles O. Brown, \$3,180. The bids of Mahoney Bros., the Archer-Pancoast Manufacturing Company, and the Manley-Cooper Manufacturing Company being the lowest were accepted. The work must begin within twenty days and be completed within four months. The armory will cost about \$280,000.

The Armory Board has directed the secretary to advertise for new plans for the Twenty-second Regiment Armory, on the Boulevard, between Sixty-seventh and Sixty-eighth Streets.

FALL RIVER, MASS. — Governor Robinson has vetoed the bill, which has passed the State Legislature, giving to Fall River the right to draw a supply not exceeding 1,500,000 gallons daily from North Watuppa Pond. The bill has now been passed by the Legislature over the veto.

FALL RIVER, MASS. — The iron reservoir contracted for by the city for its high-water service will be 73 feet in diameter and 37 feet high, and will be built of steel plate, with a capacity of over 1,000,000 gallons. The Cunningham Iron-Works Company, of Boston, has been awarded the contract to build it.

GREENSBURG, PA. — A correspondent writes: "The City Council after receiving bids for the construction of the water-works have rejected all, as being either too high or not in accordance with specifications, after which they concluded to accept a bid from the American Water-Works and Guaranty Co., for the franchise at \$3,600 per year. Moffet, Hodgkins & Clark, of Watertown, N. Y., now threaten to enjoin the city from contracting with the American Water-Works Co., on the ground that their bid was the lowest (\$3,400) and in accordance with the plans, while the American Company claim they have a binding contract and intend to hold the city to it."

NEWARK, N. J. — The Board to Prevent Pollution of the Passaic River has adopted a resolution requesting the Aqueduct Board of Newark and the Board of Public Works of Jersey City to give this board power to take action in regard to punishing persons who pollute the waters of the Passaic and its tributaries, and to take all necessary legal action to prevent pollution of the water by any one.

ONTARIO DRAINAGE. — To further the scheme for general farm drainage in the Province of Ontario, to which we have several times briefly referred, the wardens met in Toronto June 30. The objects of the movement were stated to be in order to amend and simplify the Ontario Drainage Act, in order to satisfy the diversified interests and wants of the farmers of the province. Another object was to obtain loans from the Government for drainage purposes at a more reasonable rate of interest than was at present charged. The object of the meeting was to appoint a committee to wait on the Dominion and Provincial Governments. The bill which it was proposed to submit to the Legislature asked that the expense of all leading outlets or discharges should be borne by the municipalities, with money borrowed from the Government at a rate not exceeding 2½ per cent. extending over a term of twenty years, the loans to be repaid in annual installments, and the municipalities to have the privilege of liquidating the debt at the expiration of five years. Also, that the Government should appoint one engineer to report to the Government on drainage matters and inspect lands and drains, the expense of the engineering staff to be paid out of a fund set apart for that purpose by the Government. The speaker said it was believed the 2½ per cent. interest would be sufficient to pay the expenses of engineering. It was proposed

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DEATH-RATES IN THE UNITED STATES.

In a previous editorial upon the vital statistics of the United States, as shown by the report of Dr. J. S. Billings upon the mortality statistics of the tenth census, the birth-rates in different parts of the country were more especially commented upon. By far the greater part of the report is devoted to the statistics of deaths, and it is to some of the facts brought out in connection with these that we now invite the attention of our readers.

The general or average death-rate of the whole United States is very fairly estimated as being about 18 per 1,000; that is about the same as the average annual death-rate in Sweden and in the rural districts of England. The death-rate in 1880 of France was 23.6; of England, 20.5; of Belgium, 22.4; of the German Empire, 26.1; of Austria, 29.6, and of Italy, 30.5—so that the United States has a comparatively low mortality-rate. This general death-rate for the whole country is not of much interest or practical value, for the conditions as to climate, soil, altitude, occupation, density of population, etc., differ so widely in different parts of the country that we should expect death-rates, and especially death-rates from different causes, to differ widely and to give correspondingly different indications. Hence it is by comparisons of the death-rates of the different localities that we may hope for useful results. To some extent the report before us gives the means of making such comparisons, but for large parts of the country the data are so incomplete that comparisons can only be made indirectly and unsatisfactorily.

According to this report the expectation of life of a male child at birth in the State of Massachusetts is 41.74 years, or a very little less than it is in England—i. e., 41.92 years. For white males at birth the expectation of life is: In the District of Columbia, 41.06; in Boston, 37.04; in New York City, 33.28; in Brooklyn, 37.52; in Philadelphia, 40.16; in Baltimore, 36.49; in Charleston, 35.51; in New Orleans, 33.87; in Cincinnati, 37.73; in Chicago, 38.11; in St. Louis, 36.75; and in San Francisco, 38.02.

If instead of white males we take colored males, the expectation of life at birth tells a very different story. In the District of Columbia it is 23.58; in Baltimore, 21; in Charleston, 21.30; in New Orleans, 22.78. The life tables, giving for each of the above-named places the mortality of and the expectation of life at each group of ages, contain some curious and very useful data to which we refer our readers. One of the specially interesting features of the report is the manner in which it brings out some of the relations of race to death-rates. The great difference between the mortality of the white and of the colored population in large cities is shown by the expectation of life figures which we have given above. The difference is much less in the rural districts; but even in these the death-rate of the colored is at least three, and more frequently from five to ten more per 1,000 of population than it is among the whites.

The data relative to Indians are imperfect, but they indicate a high death-rate. In a population of 78,521 Indians living in reservations the death-rate was probably not far from 30 per 1,000. The influence of race upon the mortality from certain special diseases receives much attention in the report, and the remarks upon diphtheria, scarlet fever, cancer, consumption, etc., will be found of much interest to physicians.

In the fifty largest cities in the country typhoid fever is reported as causing 16.7 in each 1,000 deaths from specified causes, while in the rest of the country it caused more than double this proportion—i. e., 36 per 1,000—thus showing that it is not so much a disease of sewered cities having a general water-supply as it is of places where privies and wells are chiefly used.

The most special and unusual feature of this report is the section which relates to morbidity or sick-rates.

Here, again, the data are imperfect, but they are sufficient to permit of some comparisons as to the healthfulness of different parts of the country. For the total population over fifteen years of age, which is the only portion to which it seemed worth while to apply this inquiry, the number found sick out of every 1,000 living varied from 7.7 to 22.7 for males, and from 8.1 to 17.5 for females, the mean being, for males, 13.41, and for females, 12.15. In the North Atlantic Coast region the proportion of sick per 1,000 was 15.78; in the Middle Atlantic Coast region, 10.74; in the South Atlantic Coast region, 14.29; in the Lake region, 13.15; and in the interior plateau region, 12.34.

These figures are much lower than those usually assumed for sick-rates, which are commonly estimated as being twice the death-rate, but, as Dr. Billings remarks, it is probable that these tables, although derived from incomplete data, do represent to a very considerable extent the different proportions of sickness occurring in males and females, and in certain groups of ages, and that it is probably as reliable a paper of this kind, based on a large number of observations, as any which has yet been published.

The only special disease considered in these statistics is cancer. Out of every 1,000 persons reported as sick, about eleven were reported as suffering from cancer, the proportion varying from fifteen in Vermont and Maine to three in California. The geographical distribution of cancer indicated by the sick-rate corresponds very well to that indicated by the death-rate from this disease.

It is impossible to examine this report carefully without being impressed with the great value of vital statistics to a nation, and with the very insufficient and unsatisfactory way in which the collection of such statistics is provided for in this country. Not even all the data collected by the census have been used, owing to a want of clerical force to make the necessary tabulations. It is to be hoped that in the next United States census this defect will not exist, and also that we shall before many years have something more reliable than census data by which to estimate our death-rates.

to spend the provincial surplus of six millions in draining 50,000 acres for each of 511 townships in Ontario. A committee was appointed to wait on the Ontario Government with a view to securing their consent to advance money for drainage purposes at a low rate of interest, and also prepare a scheme to be laid before an adjourned meeting of wardens.

RICHMOND, ME.—The town voted June 28 to contract with responsible parties to furnish water for fire purposes by a system of water-works to be erected immediately. A committee was appointed to arrange the contract and report at the town meeting July 1.

SYRACUSE, N. Y.—The Salmon River Water Company has filed articles of incorporation, and proposes to furnish a supply of water to the city. The incorporators are: Webster R. Chamberlin, William A. Sweet, George B. Leonard, Anson M. Palmer, and Riley V. Miller.

GOVERNMENT WORK.

SHREVEPORT, LA.—Synopsis of bids for iron-work, stairways, glass, hardware, and wood flooring for Post-Office, Court House, etc., opened July 2, 1886:

BIDDERS.	Amount.	Deductions if sheet-glass be substituted for plate-glass in two upper tiers of Post-Office screen.
McCarthy & Corbett.....	\$14,389.00	\$400.00
Robert Mitchell Furniture Co.....	13,453.00*	250.00
A. H. Andrews & Co.....	13,053.00†	250.00
Harris & Wilson.....	16,036.55	.....
John Moore.....	21,447.00	250.00
John Mitchell.....	17,500.00	238.00
Smith, Sargent & Co.....	14,267.37	268.65
	16,210.00	352.00

* Pine. † Cypress.

CANAL CONVENTION.—The Union for the Improvement of the Canals of New York State, No. 55 Liberty Street, this city, has called a convention to meet at Syracuse, August 25, to consider measures for the improvement of the canals. Organizations of citizens in this State representing mercantile, manufacturing, agricultural, and other interests, and cities, towns, and counties are requested to send delegates to the convention. They will confer a favor on the Union by informing the Executive Committee, at the above address, of their intention to be represented. The committee has prepared blanks, which they will distribute, on which those expected to be present may write their names and addresses, to be sent to the committee.

THE ST. LOUIS, ARKANSAS AND TEXAS RAILWAY, R. L. Van Sant, Chief Secretary, advertises for 4,100 cubic yards of excavation, 230,000 feet B. M. lumber, 1,350,000 brick, and 600 squares of gravel roofing, for new round-house and shops at Pine Bluff.

TUBE TUNNEL.—London *Architect* describes the tunnel tube which it is proposed to lay between Prince Edward's Island and the mainland of the Dominion of Canada. It is proposed to construct a tunnel tube resting on the bed of Northumberland Straits. The plans which have been accepted by the Government of the island have been under the consideration of a committee of engineers, submitted to the Dominion Government, and the scheme is to be brought before the Canadian Parliament. Four lines have been surveyed across the straits, and a plane or plateau has been found on which the tunnel tube can be successfully laid. It is proposed to build on each side of the straits piers inside of the "bordice" through which the tube is to be driven for some 2,800 feet, the total length of the huge pipe or tunnel being 6½ miles, or about 5½ nautical miles between the piers. The bottom of the straits shows a very good road-bed, the depth of water varying from 36 feet on the island side to about 80 feet in the middle of the straits, and thence ashore on the New Brunswick side to 10½ feet. The tunnel is to be 18 feet in diameter, and to be constructed of heavy sections of chilled white cast iron, four inches thick or more, according to depth. It is estimated that, at the present market price, the cost of the iron for the tunnel would be about £17 per linear foot, making the total estimated cost of the work close upon £1,000,000. The white metal is stated to be non-corrosive in sea-water, as shown by

its exposure for twelve years in the harbor of Sydney. The sections are bolted together by inside flanges, making a water-tight rust-joint with a smooth exterior. A connection with the surface can be maintained by a vertical shaft. Where the depth of water will allow of the obstruction to the channel, the tunnel is to be laid on the natural bottom of the straits; otherwise a channel is to be dredged, in which the tube is to be sunk.

WE find the following item going the rounds: An attempt was recently made to blow up by dynamite a new reservoir which is in course of construction at Callington, Eng. The work is rapidly approaching completion, and the reservoir has a stout masonry wall covered with brick arches, with provision for a manhole in the centre. On a granite block near the manhole a large charge of dynamite was placed and fired during the night, and the explosion was so loud that it was heard for several miles round. Fortunately, however, the charge did not prove sufficient to do the damage that was evidently intended, although the brick-work is destroyed in many places, and scattered about in all directions. No reason can be assigned for the act, although a great deal of prejudice has existed against the water company ever since its formation, and it is believed that this prejudice has found its outcome in the outrage. A reward of £25 has been offered for the discovery of the offenders.

THE contract for constructing and putting in place the great dome for the Lick Observatory at Mt. Hamilton has been awarded to a San Francisco firm at \$56,850. It is to be of steel, seventy-six feet in diameter, and will weigh 127 tons when completed. The contract for mounting the telescope has been given to a Cleveland firm for \$42,000. The telescope, when finished and set in position, will have cost, according to the San Francisco *Bulletin*, \$164,850, distributed as follows: Dome, \$56,850; mounting, \$42,000; visual objective, \$53,000; additional cost of the photographic objective, \$13,000.

RIVER AND HARBOR APPROPRIATIONS.—Below we give some of the items, chiefly in Western States, of the River and Harbor Bill, as prepared by the Senate Committee:

Pennsylvania—Allegheny River, for Herr's Island dam, \$50,000.
West Virginia—Great Kanawha River, \$200,000.
Ohio—Ashtabula, \$40,000.
Indiana—Michigan City, \$75,000.
Minnesota—Duluth, \$75,000.
Oregon—Yaquina Bay, \$100,000; Coos Bay, \$45,000; Portland Harbor, \$5,000; Cascades, \$250,000; Columbia River, \$250,000.
Michigan—Portage Lake Canal, \$350,000; Sturgeon Bay Canal, \$150,000.
Louisiana—Bayou Terre Bonne, \$10,000; Red River, \$65,000.
Illinois—Hennepin Canal, \$300,000.
Arkansas—Fourchee River, \$5,000; Arkansas River (snags), \$75,000.
Mississippi River surveys, \$25,000.
Tennessee—Cumberland River, \$50,000; Mussel Shoals, \$250,000.
Kentucky—Kentucky River, \$200,000.

Patents.

No. 343,104 is a patent for a section for steam-generators, issued to Edwin R. Bryant, of Rochester, N. Y., assignor to the Rochester Machine Tool Works, for a steam-generator, formed with a peripheral tube or chamber, hollow central ring, and hollow arms joining said tube and ring, the cavities of said arms communicating, respectively, with the interiors of said tube and ring, said central ring being formed above the plane of the axial line of said tube or chamber.

No. 343,038 is a patent for a pipe-wrench, issued to Albert Langston, of Council Bluffs, Iowa, for the combination, with a handle terminating in a curved-face gripping-jaw, and having a perforated lug, of a gripping-jaw pivotally secured to said handle, and provided with a projecting lug and a set-screw working in the perforated lug of the handle and engaging the lug of the pivoted gripping-jaw.

No. 342,853 is a patent for a fitting for steam and all other valves, issued to James G. Whitlock, of Richmond, Va., for the combination, with the valve-stem and handle of a steam or hot-water apparatus, of an asbestos packing, applied to the tang of the stem and the handle entirely separating them and preventing metallic contact.

No. 343,431 is a patent for a combined steam and hot-water heater, issued to William J. Bowerman, of Detroit, Mich., in which an upright cylindrical steam-heater, combined with an annular hot-water boiler surrounding said heater, in proximity to the combustion-chamber, but entirely independent of said heater, and provided with a series of hot-water-circulating pipes arranged outside of, and independent of the steam-heater, whereby the said hot-water boiler may be removed without disturbing the steam-heater.

No. 343,233 is a patent for a pipe-cutter, issued to Albert H. Esten, of Amesbury, Mass., for the combination of hollow stock, formed with serrated head, a rotary wheel fixed in a cutter, a bar arranged in the passage in the stock and rod and provided with a handle, screw-threaded, for rotating it, with a bar toothed in hook, and an adjusting-pin.

No. 342,879 is a patent for a coffee steamer or urn, issued to James S. Sanborn, Boston, of Mass. In a coffee steamer or urn, the combination, with a boiler and its inclosed coffee-receptacle, of a coffee-steeping vessel placed over the same and provided with a series of steam-pipes, communicating with the boiler and extending up to or nearly to the top of the steeping-vessel and down within it to or nearly to the bottom whereby the steam is always discharged below the level of the extracting-liquid in said steeping-vessel, for the purpose of constantly maintaining the same at a high temperature.

No. 342,875 is a patent for a steam-generator issued to William H. Page, of Preston, Conn., for the combination of sections having water-connections and flue-passages, having water-ways etc.

No. 343,359 is a patent for a gas-regulator, issued to Michael J. Berry, of Bradford, Pa., in which a gas-regulator connecting gas-supply pipe with a gas-distributing pipe, and consisting of a T placed between such pipes, carrying cup supporting the pipe and provided with a movable bell, suspended over the pipe from a rope or its equivalent passing over pulleys and having one end secured to the adjustable weighted handle of a stop-cock located upon said pipe.

No. 343,435 is a patent for a combined feed-water purifier and boiler-cleaner, issued to Edward G. T. Colles, of Chicago, Ill., in which a combined feed-water purifier and boiler-cleaner, the boiler, a deflector located therein, and a feed-water-supply pipe connected with the boiler above said deflector, in combination with a receiver-pan or scum-gatherer located in said boiler, beneath said deflector.

No. 343,234 is a patent for a steam-cooking utensil, issued to John Farrell, of St. Louis, Mo., for the combination of a tilting steam-vessel, or kettle, stew-pan in combination with tubular standards, for the admission of steam, and the drawing away of the water of condensation.

No. 343,283 is a patent for a stop-cock, issued to William Swabel, of San Francisco, Cal., in which the combination of the shell provided with suitable ports, together with the plug fitting within said shell, and having suitable ports, said plug consisting of a continuous or integral cylindrical piece, and a vertically-reciprocating wedge within the plug and bearing against its walls, whereby they are forced to fit the shell.

No. 343,138 is a patent for a coupling for water-closet bowls, issued to Timothy McHugh, of Boston Mass., assignor of one-half to Ward & Curley, same place, for the combination of a neck of a bowl having a shoulder, a rubber packing-ring formed to cover both the end of the neck and the shoulder and the periphery of the neck between said end and shoulder and a tail pipe, having an externally-screw threaded end formed to bear against the upper ring, and a coupling-nut formed to engage the threaded portion of the tail-pipe, having a flange between which and the shoulder the rubber ring is clamped.

No. 343,187 is a patent for a vise, issued to Alphonse Montant, of New York, N. Y., having a fixed and movable jaw, for the combination, with a screw and handle, and a serrated sleeve and nut.

No. 343,177 is a patent for a recording pressure-gauge, issued to Florentine A. Jones, of Malden, Mass., which is an improvement on Jones's and Glines's patent, No. 287,684, dated October 30, 1883, and Jones's patent, No. 287,686, dated October 30, 1883, for an article of manufacture comprising a pressure-indicating mechanism, a pressure-recording mechanism, a Bourdon spring or springs, a recording-surface, and a clock-work mechanism.

BOOKS AND PAMPHLETS RECEIVED.

SIXTH ANNUAL REPORT OF THE BOARD OF HEALTH OF THE CITY OF HAVERHILL, MASS., for the year ending December 31, 1885. Haverhill: Mitchell & Hoyt.

ANNUAL REPORT OF THE CHIEF ENGINEER U. S. ARMY. 1885. Parts I., II., III., and IV. Washington: Government Printing Office. 1885.

MINUTES OF PROCEEDINGS OF THE INSTITUTION OF CIVIL ENGINEERS. Vol. LXXXIII. London: Published by the Institution, 25 Great George Street, Westminster, S. W. 1886.

INSTITUTION OF CIVIL ENGINEERS. *Excerpta Minutes of Proceedings: Injurious Effect of a Blue Heat on Steel and Iron*, by C. F. Sturtevant, Assoc. M. Inst. C. E.; *Gas-Producers*, by Frederick John Rowan; *Rail-Joints and Steel Rails*, by Christy Peter Sandberg, Assoc. M. Inst. C. E.; *Rate of Hardening of Cement and Cement Mortar*, by Prof. William Cawthorne Unwin, M. Inst. C. E.; *Strength of Steel and Wrought-Iron Girders*, from Report of Dutch Minister of Public Works, The River Seine, by Francis Vernon-Harcourt, M. Inst. C. E.; *Experiments on the Discharge of Water of Different Temperatures*, by John George Mair, M. Inst. C. E. Published by the Institution, 25 Great George Street, Westminster, S. W.

ANNUAL REPORT OF THE CLERK OF THE BOARD OF HEALTH OF THE CITY OF KANSAS, MO. January 1, 1886. Kansas City: Press of Ramsey, Millett & Hudson.

ANNUAL REPORT OF THE BOARD OF HEALTH OF THE CITY OF WALTHAM, for the year ending January 3, 1886. With map.

FIFTH ANNUAL REPORT OF THE BOARD OF WATER COMMISSIONERS OF THE CITY OF AMSTERDAM, N. Y. *Democrat Print.*

EXCERPTA FROM THE BIENNIAL REPORT OF THE STATE BOARD OF HEALTH OF LOUISIANA. 1884-1885. New Orleans: Printed by E. A. Brandao & Co.

ANNOUNCEMENT.

The publication of the sixth revised edition of the U. S. Pharmacopoeia (1880), containing as it does more strict requirements for the purity and strength of pharmaceutical preparations, has been followed in some States of the Union by the enactment of laws against the adulteration of drugs, which laws make the Pharmacopoeia the official standard.

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THE SANITARY ENGINEER.

DEVOTED TO

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DEATH-RATES IN THE UNITED STATES.

In a previous editorial upon the vital statistics of the United States, as shown by the report of Dr. J. S. Billings upon the mortality statistics of the tenth census, the birth-rates in different parts of the country were more especially commented upon. By far the greater part of the report is devoted to the statistics of deaths, and it is to some of the facts brought out in connection with these that we now invite the attention of our readers.

The general or average death-rate of the whole United States is very fairly estimated as being about 18 per 1,000; that is about the same as the average annual death-rate in Sweden and in the rural districts of England. The death-rate in 1880 of France was 23.6; of England, 20.5; of Belgium, 22.4; of the German Empire, 26.1; of Austria, 29.6, and of Italy, 30.5—so that the United States has a comparatively low mortality-rate. This general death-rate for the whole country is not of much interest or practical value, for the conditions as to climate, soil, altitude, occupation, density of population, etc., differ so widely in different parts of the country that we should expect death-rates, and especially death-rates from different causes, to differ widely and to give correspondingly different indications. Hence it is by comparisons of the death-rates of the different localities that we may hope for useful results. To some extent the report before us gives the means of making such comparisons, but for large parts of the country the data are so incomplete that comparisons can only be made indirectly and unsatisfactorily.

According to this report the expectation of life of a male child at birth in the State of Massachusetts is 41.74 years, or a very little less than it is in England—i. e., 41.92 years. For white males at birth the expectation of life is: In the District of Columbia, 41.06; in Boston, 37.04; in New York City, 33.28; in Brooklyn, 37.52; in Philadelphia, 40.16; in Baltimore, 36.49; in Charleston, 35.51; in New Orleans, 33.87; in Cincinnati, 37.73; in Chicago, 38.11; in St. Louis, 36.75; and in San Francisco, 38.02.

If instead of white males we take colored males, the expectation of life at birth tells a very different story. In the District of Columbia it is 23.58; in Baltimore, 21; in Charleston, 21.30; in New Orleans, 22.78. The life tables, giving for each of the above-named places the mortality of and the expectation of life at each group of ages, contain some curious and very useful data to which we refer our readers. One of the specially interesting features of the report is the manner in which it brings out some of the relations of race to death-rates. The great difference between the mortality of the white and of the colored population in large cities is shown by the expectation of life figures which we have given above. The difference is much less in the rural districts; but even in these the death-rate of the colored is at least three, and more frequently from five to ten more per 1,000 of population than it is among the whites.

The data relative to Indians are imperfect, but they indicate a high death-rate. In a population of 78,521 Indians living in reservations the death-rate was probably not far from 30 per 1,000. The influence of race upon the mortality from certain special diseases receives much attention in the report, and the remarks upon diphtheria, scarlet fever, cancer, consumption, etc., will be found of much interest to physicians.

In the fifty largest cities in the country typhoid fever is reported as causing 16.7 in each 1,000 deaths from specified causes, while in the rest of the country it caused more than double this proportion—i. e., 36 per 1,000—thus showing that it is not so much a disease of sewered cities having a general water-supply as it is of places where privies and wells are chiefly used.

The most special and unusual feature of this report is the section which relates to morbidity or sick-rates.

Here, again, the data are imperfect, but they are sufficient to permit of some comparisons as to the healthfulness of different parts of the country. For the total population over fifteen years of age, which is the only portion to which it seemed worth while to apply this inquiry, the number found sick out of every 1,000 living varied from 7.7 to 22.7 for males, and from 8.1 to 17.5 for females, the mean being, for males, 13.41, and for females, 12.15. In the North Atlantic Coast region the proportion of sick per 1,000 was 15.78; in the Middle Atlantic Coast region, 10.74; in the South Atlantic Coast region, 14.29; in the Lake region, 13.15; and in the interior plateau region, 12.34.

These figures are much lower than those usually assumed for sick-rates, which are commonly estimated as being twice the death-rate, but, as Dr. Billings remarks, it is probable that these tables, although derived from incomplete data, do represent to a very considerable extent the different proportions of sickness occurring in males and females, and in certain groups of ages, and that it is probably as reliable a paper of this kind, based on a large number of observations, as any which has yet been published.

The only special disease considered in these statistics is cancer. Out of every 1,000 persons reported as sick, about eleven were reported as suffering from cancer, the proportion varying from fifteen in Vermont and Maine to three in California. The geographical distribution of cancer indicated by the sick-rate corresponds very well to that indicated by the death-rate from this disease.

It is impossible to examine this report carefully without being impressed with the great value of vital statistics to a nation, and with the very insufficient and unsatisfactory way in which the collection of such statistics is provided for in this country. Not even all the data collected by the census have been used, owing to a want of clerical force to make the necessary tabulations. It is to be hoped that in the next United States census this defect will not exist, and also that we shall before many years have something more reliable than census data by which to estimate our death-rates.

UNDERCLOTHING.

By this time our readers, or, at least, those of them who are in the large cities, are probably using the thinnest underclothing they can find. In the process of changing from winter to summer wear some have no doubt taken cold, aggravated their rheumatism somewhat, or had some other disagreeable little experience, but just now they want the coolest material possible. The statement that woolen underclothing is best in summer as well as in winter, that it is upon the whole more comfortable and healthful than linen or cotton stuffs, will be received with doubt by many and by some with positive denial, yet it is the truth as regards the great majority of people. There are, it is true, a few persons who cannot wear woolen next the skin either in winter or in summer without the production of great irritation and discomfort, but the number is extremely small, and the majority of those who think that they belong to

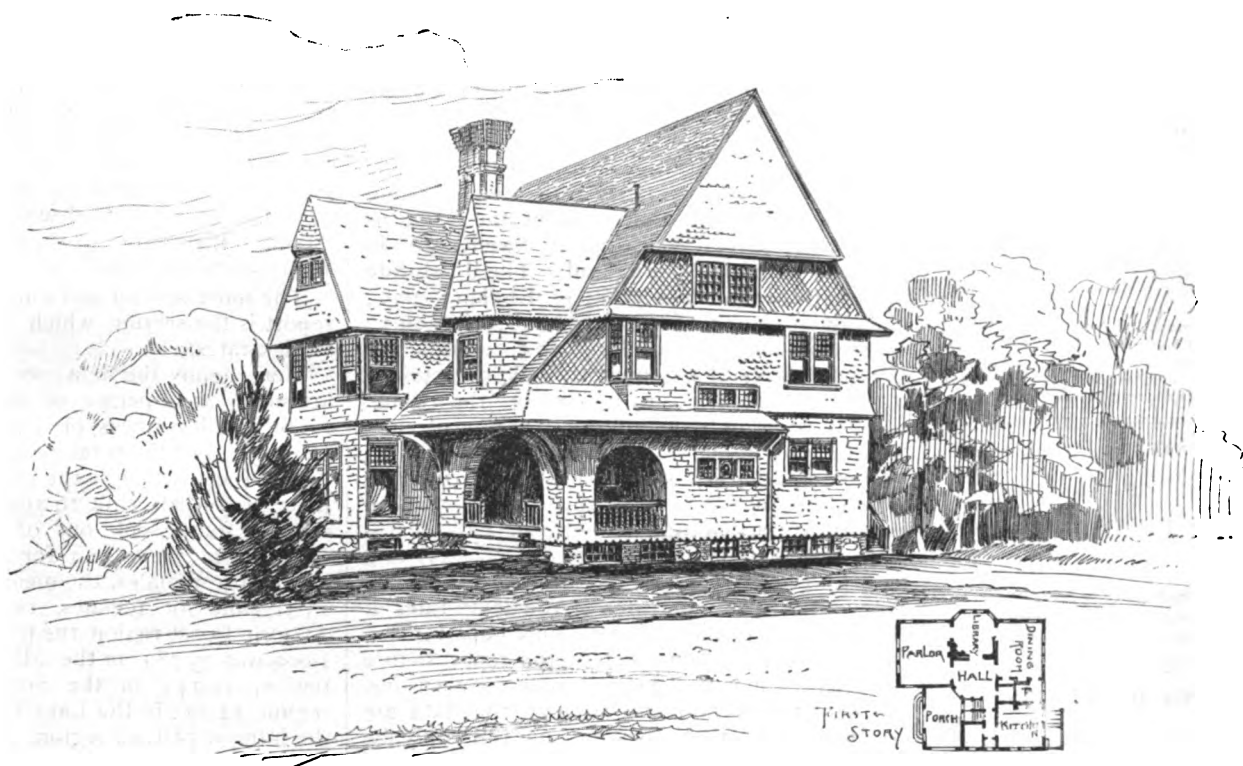
in our climate, both from variations in the temperature and movements of the air, and from differences in the conditions of the body as regards exertion and rest.

During exercise in warm weather a man with woolen underclothing will at first feel warmer than the man who has linen or cotton next his skin, because the wool is not so good a conductor and does not permit of the rapid evaporation of perspiration as soon as it is formed, but after a little time the difference in this respect will be small, and when the exertion ceases the man with the woolen underclothing will be much less likely to catch cold and experience discomfort.

The only valid objection to be urged against wearing woolen next the skin in warm weather is that men are less likely to change it as frequently as is desirable, because it does not show dirt as quickly as linen.

be lifted right and left, until flush with the piers, by machinery contained in the towers. A fixed footway will be about 150 feet above Trinity high-water mark, and two lifts, also contained in the towers, as well as staircases, will communicate with this footway when the centre is lifted. The centre span will be fifty feet. Suspension-rods will carry the two land spans. Mr. Horace Jones, Past-President R. I. B. A., who is the architect, will have the advantage of co-operation with Mr. John Wolfe Barry as engineer.

The work carried out here by the Central Sanitary Aid Committee, which is the outcome of the Mansion House Council on the Dwellings of the People, deserves recognition. The object of the committee is the enforcement of the various sanitary laws for dwellings in the metropolis, specially with reference to the houses of the poorer classes. There is great reluctance in many cases on the part of the lower classes throughout the city to lodge complaints respecting any defective sanitary arrangements or the existence of any nuisance. Owing to the fact that they are to a great extent at the mercy of their landlords, either on



A RESIDENCE AT SHORT HILLS, N. J.—FREDERICK B. WHITE, ARCHITECT.

this class can in reality wear woolen underclothing with ease and comfort after a very few days' experience. The slight stimulation of the surface of the skin which is produced by the woolen fibre is desirable and agreeable unless it produces irritation in unusually sensitive persons.

The objection often made to the use of woolen underclothing in summer on the ground that "it is too heavy," simply means that the objector has used too heavy garments, for, as a matter of fact, properly made woolen undergarments for summer are lighter than those made from other substances.

"Woolen" does not necessarily mean "flannel," as some suppose; there are fine, thin, soft merino stuffs which are neither heavy nor irritating. Next to woolen as a desirable material for underclothing comes silk, but neither in winter nor in summer is silk to be preferred to wool.

The great value of woolen underwear is that it prevents or lessens the bad effects which result from the rapid changes of heat which occur

OUR BRITISH CORRESPONDENCE.

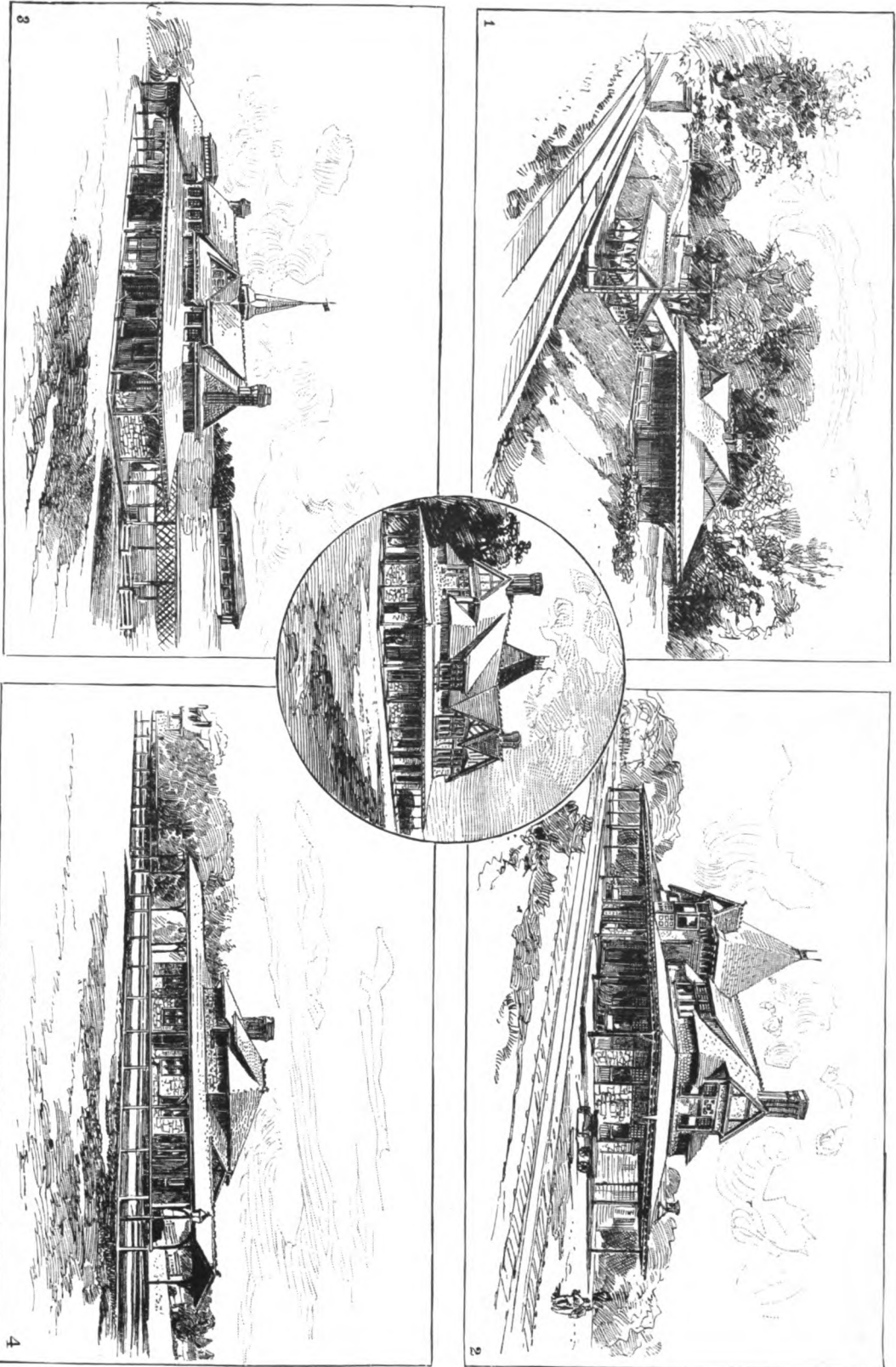
A Memorial to the Late Lord Shaftesbury—Laying the Foundations of the New Tower Bridge—The Central Sanitary Aid Committee—Annual Meeting of the Association of Municipal and Sanitary Engineers.

LONDON, June 26, 1886.

A MOVEMENT is on foot for the establishment of some lasting memorial to the late Lord Shaftesbury. It has been decided by the committee that the memorial should take the form of (1) a marble statue in Westminster Abbey, (2) a bronze statue in combination with drinking-fountain in some public thoroughfare, and (3) a convalescent home for poor children. The committee, to whom Mr. H. R. Williams, of 6 Lime Street, E.C., is Secretary, have wisely decided that subscribers may indicate to which special form of memorial they wish their donations to be applied.

The Prince of Wales has laid the foundation-stone of the new Tower Bridge, destined for the traffic across the Thames, below London Bridge. This is to be of the Bascule type. Two towers of the quasi-Gothic character will support the centre span, which, opening in the centre, will

account of being in arrears with rent, or not being in a position to bear the expense of removal should the landlord resent any information given to the sanitary authorities, the poorest class of tenants will often put up with such state of things, which is not only personally inconvenient, but also dangerous to the public health. Further, this class of the population has not, of course, any great degree of influence. Supposing, therefore, that an information is laid with the sanitary inspector by a member of this class of tenants, it is too often the case that owing to the enormous district under his care the inspector absolutely cannot personally follow up every order for abatement that may be made, and if in the interval the landlord's influence has been brought to bear on the tenant the matter is simply allowed to let "slide." Bearing upon this statement of the physical inability on the part of the inspector it should be said that, in some cases, a single inspector has in the district allotted to him some 50,000 poor, a number which places it out of his power to do the work well. This Sanitary Aid Committee, therefore, whose labors are perfectly voluntary, have established a number of local committees throughout the poorer neighborhoods, the members of which also give their services gratuitously.



THE SANITARY ENGINEER ILLUSTRATED SERIES.

STATIONS ON THE PHILADELPHIA, GERMANTOWN & CHESTNUT HILL RAILROAD.

W. BLEDDYN POWELL, ARCHITECT.

for the purpose of receiving information of such matters and seeing that all cases receive proper attention. A feature in the proceedings of these committees is that no names of informants are divulged, the inspectors of the committees verifying any complaints before calling the attention of the sanitary officers to same, and acting on their volition in forcing the local authorities to give effect to the various sanitary laws. In certain cases, such as in Clerkenwell and Mile End, the Central Council, not being satisfied with the remedies possible, initiated inquiries by the Home Office. Some idea of the amount of work done during the past year by these various committees may be gathered from the fact that 6,000 cases of insanitary dwellings were dealt with. The total expense incurred for office rent, printing, and advertising and clerical work was less than £750 (\$3,600), which sum was derived from public donations. The result reflects great credit on those who gave their services for such valuable work, but at the same time it is by no means creditable that such work should necessarily be taken up by a "vigilance committee" in default of action on the part of public authorities. The force of sanitary inspectors should be largely augmented; at present it stands at less than 100 for the whole of the district under the authority of the Metropolitan Board of Works, covering some 76,000 acres, with a population of nearly 4,000,000, and it is only humanly possible for these men, with the best intentions of doing their duty, to do only a very small proportion of the work for which they are appointed.

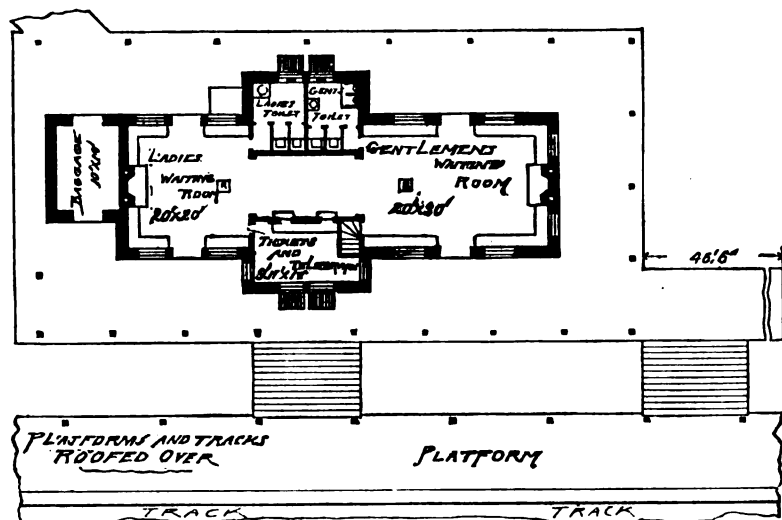
The Annual Meeting of the Association of Municipal and Sanitary Engineers will be held this year at Hanley, Staffordshire, on the 8th, 9th, and 10th of July. The following papers will be read: "The Present State of the Rural Road Question and the Maintenance of Macadamized Roads," by Ellice Clark, M. I. C. E.; "The Recent Sewerage Operations in Nottingham and Neighborhood," by M. Ogle Tarbotton, M. I. C. E.; "Street-Watering," by W. Santo Crimp, A. M. Inst. C. E.; "The Public Supply of Electricity as an Illuminant," by James N. Shoolbred, B. A. Inst. C. E.; "The Economic Production of Coal-Gas," by R. P. Spice, M. I. C. E.; and "The Refuse-Destroyer at Nelson," by William Dent. The members will also visit the leading potteries, etc., in the district, and principal public works, Sanitary Hospital, etc., under the guidance of Mr. J. Loble, the Boro' Engineer.

SAFETY-VALVE.

OUR ILLUSTRATION OF A MODERATE-COST HOUSE.

A RESIDENCE AT SHORT HILLS, N. J.—FREDERICK B. WHITE, ARCHITECT.

THIS house is the residence of A. J. Wills, Esq., at Short Hills, N. J. The finish of the interior is stained white pine. The stairway is of ash, the floors are of yellow pine. The cost of the house was \$6,300. It was designed by the late Frederick B. White, of New York, whose practice is now being carried on by Mr. Wilbur S. Knowles, who was formerly associated with Mr. White.



CHESTNUT HILL STATION.

PLANS OF STATIONS ON THE PHILADELPHIA, GERMANTOWN, AND CHESTNUT HILL RAILROAD.

OUR SPECIAL ILLUSTRATION.

STATIONS ON THE PHILADELPHIA, GERMANTOWN, AND CHESTNUT HILL RAILROAD.

WE give this week views and plans of several stations on the short line of road running from Philadelphia to Chestnut Hill. No. 1 is the Allen's Lane Station; No. 2 Cheltenham Avenue, of which the little circular view in the centre shows the other side; No. 3 is the terminus at Chestnut Hill, and No. 4 is the station at Wissahickon. The station at Allen's Lane is of brick; the others are of stone, with some half-timber and shingle work in the upper stories. The stations were designed by W. Bleddyn Powell, architect of the road.

UNDERGROUND RAILWAYS IN CITIES.

No. V.

(Continued from page 130.)

THE PROBLEM IN NEW YORK CITY.

THE rapid growth of traffic on the elevated roads in New York to the point where, at certain hours, their full capacity is reached, has again turned public attention to the various schemes for underground communication. Among these may be noted: the Central Underground, the Beach Pneumatic, the Arcade, the District Railway, and the Central Tunnel Company. The first of these proposed a double-line tunnel route, beginning with a loop around the City Hall to Centre Street; thence through City Hall Place to Worth Street; thence to and through Mulberry Street; thence across the blocks to and through Lafayette Place and Astor Place to Eighth Street, across the block to Ninth; thence through Fourth Avenue and Union Square to Seventeenth Street; thence through the blocks to Twenty-Third Street; thence through Madison Avenue to Harlem River, and along the river to the Third Avenue Bridge. A portion of the way the tracks would be in open cut, and from Ninety-Seventh Street north a masonry viaduct was contemplated.

The detour to the right of Broadway was doubtless made in deference to the opinion expressed by the Senate Commission in 1867 that an underground road ought not to be built in Broadway between the City Hall and Twenty-third Street. A committee consisting of such well-known engineers as W. W. Evans, E. S. Chesbrough, and General George S. Greene, reported an estimated cost, including land damages, engines, cars, stations, and construction, of \$17,625,000, which would undoubtedly be much too small at the present time.

They placed themselves on record as believing that the enterprise *would pay*.

The company did a little work at two points on their line, and it is said they are again moving.

The Beach Pneumatic Company constructed a short section of tunnel in Broadway, and imported some expensive machinery, by which an experimental car was run a short distance. The final adoption of steam-locomotives on the London underground roads as the most economical probably led to this scheme being dropped. The District Railway, organized more recently under the general railroad law, propose to run from Bowling Green through Broad-

way to Madison Square, then by way of Madison Avenue to and under the Harlem River, to a junction with the several steam roads running north from the city. They also propose several minor roads, joining this at various points.

They propose four tracks (two express and two way), and, by means of a patented material, the solid divisions between these are to be made so light that sufficient space will be left each side between the curbs for sewers, gas and water pipes.

The object of solid division-walls between tracks is to secure ventilation by keeping the trains on any one track moving in the same direction through an isolated tube, so that it may act like a piston to force out the air in advance, and draw fresh air in behind it. The tunnel is to follow closely the grade of the street, with the rails of the track at about fifteen feet below the street surface.

The details of construction are not given in the publications of the company, and the pictures shown, it is evident, are not intended other than as illustrations, the work being too light for stability.

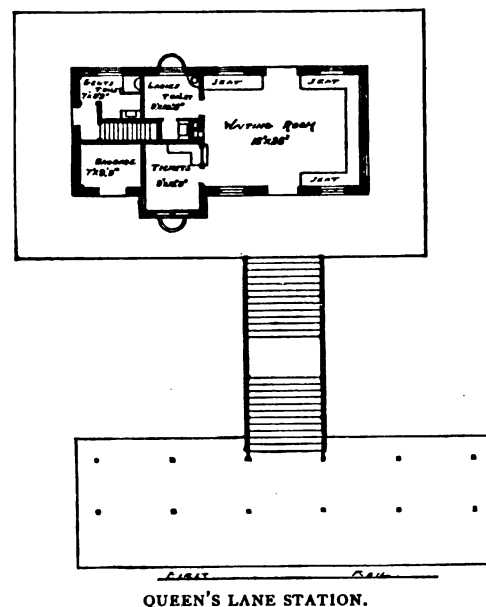
The Arcade Company propose a somewhat similar line, but intend, according to the Senate report mentioned, to excavate to twenty-five feet depth below the street surface, and to build new fronts to all buildings passed. The lower ten feet of the excavation is to be occupied by sewers and vaults.

By recent legislative action they are allowed to occupy about twelve feet more of the street, six feet on each side.

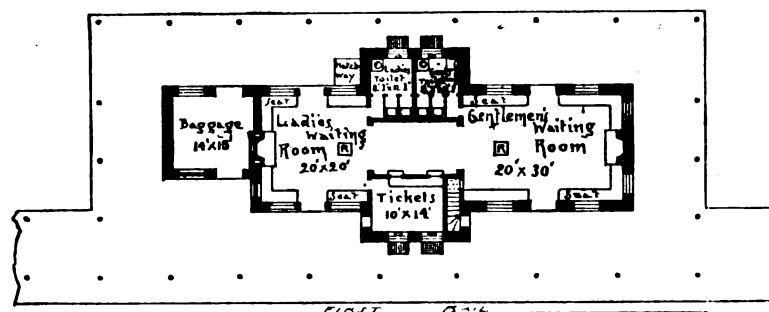
The Senate Commission of 1867 speak in high terms of the last scheme mentioned—viz., that of the Central Tunnel Company. This company proposed to build its line *mostly* in open cut through the blocks on property to be purchased, and to start at or near City Hall Park, and run under the park northerly to and under Reade to Elm Street; thence through Elm to and under Spring; thence through blocks and under cross streets to and under Great Jones Street to Lafayette Place; thence through Lafayette Place to and under Ninth Street, to Fourth Avenue; thence through Fourth Avenue to the Grand Central Depot, to connect with the Fourth Avenue improvement.

It was also proposed to run a line under Broadway from City Hall to the Battery.

In April last a petition was made to the Legislature by property holders to open a new street along this line eighty feet wide, by widening Elm Street and Lafayette Place, and cutting through blocks, joining the same by a curve to Park Row, opposite the Bridge entrance. The railroad



QUEEN'S LANE STATION.



CHELTEM AVENUE STATION.

company propose to build ventilating spaces in this similar to those now in Park Avenue over the horse tunnel. It will be seen that if the street be opened in this manner, this part of the line will be entirely in tunnel under the street. The Fourth Avenue improvement has occupied the part of the line north of this, although the plan, as originally proposed by the engineer, Mr. John Schuyler, contemplated running through the blocks to the Harlem River.

On March 22, 1886, the Central Tunnel Company sold out to the Terminal Underground Company, and the latter is the one now operating.

The cost of the original scheme was estimated to be \$250,000 per mile, exclusive of land damages, which were put at \$3,000,000.

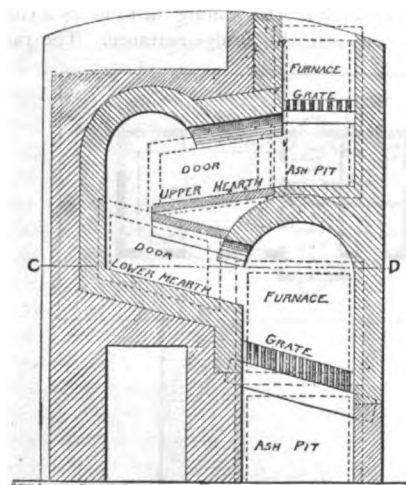
The claim made by all these schemes is, that no elevated railroad can be made to accommodate such long and heavy trains as a road on solid earth, without costing more than an underground road. It cannot, however, be said with truth that no repairs are needed on the latter. If built in brick-work and masonry, this is practically true; but where the covering is dependent on iron-work for support, rusting is even more rapid than above ground.

We have thus given a brief outline of the several solutions of the rapid-transit problem which have been proposed. That some plan ought to be put in operation soon needs no argument to prove. We do not propose to enter into a criticism of the plans until more full data are furnished, but shall welcome any well-considered project which shall be placed on a sound financial basis and promoted for other than speculative purposes. Increased facilities for communication are undoubtedly needed to-day, and the need will be much greater before any road can be built.

CREMATION-FURNACE FOR ANIMAL REFUSE AT THE JOHNS HOPKINS HOSPITAL, BALTIMORE, MD.

WE give herewith (Figs. 1 and 2) section and plan, respectively, of a small cremating furnace constructed for the Johns Hopkins Hospital in Baltimore by Bartlett, Hayward & Co., of that city.

This furnace is designed especially for the destruction of animal refuse, small dead animals such as rabbits, etc., and is well suited for use in connection with an anatomical or pathological laboratory. Under ordinary circumstances



SECTION A-B

FIG. 1.

fuel need be placed only on the lower grate, but an upper grate is provided in the exit-flue, by means of which foul gases can be completely destroyed if it should be found that they escape in unpleasant quantity from the material in process of drying in the upper hearth.

The furnace is built with 8-inch walls, the inside course being fire-brick. The lower grate area is 24"x18", and each hearth has an area of about nine square feet (one square yard). The floor-space required is 5'x3' 9", not including standing room and hood in front of furnace, and the height 6' 6".

ONE hundred and twenty-one tons of fish were destroyed at Billingsgate Market last month, as unfit for food.

SMALL-POX is now existing in violent in Williamsburg, L. I., among the tenement-house population, which is violently opposed to vaccination.

THE ANNUAL MEETING OF THE AMERICAN SOCIETY OF CIVIL ENGINEERS.

THE annual meeting of the society began, as described in our last issue, at Denver, Col., July 2, where the delegates and many ladies, as previously reported, arrived in a special train on the morning of that date.

The first session began in the Windsor Hotel at 3 P. M., Mr. John Bogart, of New York City, Secretary of the Society, calling the convention to order. Mr. Robert B. Stanton, of Denver, was chosen presiding officer, and welcomed the society to Denver.

The Secretary, Mr. Bogart, then announced the various meetings to be held by the society, and read an invitation from the Executive Committee of the Fourth of July celebration, inviting the society to witness the procession. The invitation was accepted.

The secretary then read a paper by Major R. T. Hoxie, of the Corps of Engineers of the U. S. A., on the subject of "Excessive Rainfalls."

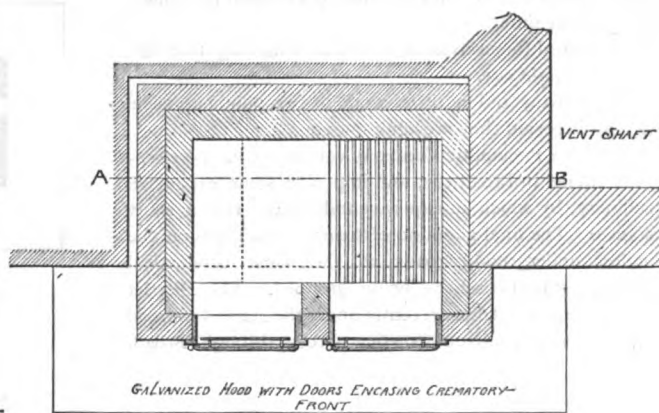
The paper was a plea for more exact determinations of areas of concentrated water fall, and a defence of the use of large sewers in many places. It showed how our knowledge of the flow from various water-sheds was incomplete.

Mr. McMath, of St. Louis, spoke of depressed basins there, ranging from 60 to 1,000 acres area, having no outlet, and where it was absolutely necessary to carry off all the drainage and sewer matter. One such of 600 acres was fully developed, and was drained by a 12-inch sewer with two-tenths fall per 100 feet, which was seldom overtaxed. May 14, 3 1/2 inches of rain fell mostly in forty minutes, and this gorged it. They had tried the method of determining sizes by induction from known examples, and sewers built since that had never failed. The plan allowed for a quantity of one cubic foot per second for each acre drained.

Mr. Stanton described a cloud-burst on Cherry Creek, which by chance was photographed, in which the water came down in a wave 10 feet high, with a width of 100 feet or more.

Mr. George Rice described one at Tombstone, Arizona, 75 feet wide and some three feet deep.

Mr. McMath mentioned a St. Louis sewer of 242 square feet section, in which a mass of rock containing 10 cubic feet was carried its whole length. (This was a reply to a contrary statement in Mr. Hoxie's paper, tending to show a lack of the velocity needed.)



PLAN C-D

FIG. 2.

Mr. Croes, of New York, said that he failed to get any definite suggestion as to the size of sewers required or the amount of rainfall to be provided against. He referred to the cloud-burst which carried away ten miles of track on the Rio Grande recently. These, he said, were liable to occur near the city of Denver, but they did not generally extend over a very large area of country at any one time. This fact was to be taken into consideration in deciding the question of the size of the sewers required.

Mr. Keifer, of Montreal inquired as to the effect of cloud-bursts upon irrigation works.

Mr. Stanton answered that the irrigation works of Denver suffered materially nearly every summer from this cause.

Mr. E. C. Clarke, of Boston, spoke of the problem of draining twelve square miles. The formula when applied gave discharges varying from 300 to 15,000 cubic yards per second. Each was doubtless correct for the conditions which gave rise to it.

Mr. Rice spoke of the remarkable fact he had noticed at Tombstone of rain for a whole week outside of a radius of five miles, and not a drop within, showing the uncertainty of rainfall tables as indicators for a large district. There was no so-called rainless district in the country.

Mr. Barnard spoke of a heavy rainfall on a dividing ridge near the Platte, when probably eight to nine inches fell during a night.

Mr. Croes started the discussion on the question of the extension of the cultivable area by the local increase of rains as a result of cultivation.

Mr. Latimer claimed that in Nebraska the belt had moved westward 300 miles.

Mr. Barnard said the records here undoubtedly show an extension of the cultivable area. As the land is turned up it absorbs more of the rain which could not before penetrate the hard surface crust, evaporation is less, and the water is retained for the benefit of vegetation. More than that, the rainfall is more uniformly distributed. Where counties on the east of the barren district were entirely unproductive there are now extensive areas cultivated, and these are constantly extending.

Mr. Rosewater, of Omaha, gave the result of his personal observation in Nebraska. As the lands are cultivated and trees planted the evaporation is less rapid, clouds form and more rain descends. The records show that the rainfall both in Kansas and Nebraska is steadily increasing. But more important still is the fact that in place of dry and wet seasons the rainfall is more evenly distributed. He thought that the same results will in time follow in the State of Colorado as have been shown in Kansas and Nebraska.

Mr. Latimer spoke of the importance of planting trees with a view to increasing moisture by diminishing evaporation.

Mr. Collingwood spoke of the observations made by Dr. Newberry and others to the effect that observations for a series of years do not bear out these statements. Vegetation will encroach on the barren regions for a number of years, and then one or more dry season will occur when there will be a corresponding recession. This was illustrated by a wide fringe of trees sometimes found along the debatable ground, which would be seen to be dead from drought and not from fire.

Mr. Blickensderfer, Chief Engineer of the Union Pacific Railroad, stated that he doubted the permanence of the extension of the cultivable land, and cited his experience at Salt Lake. In 1867 fence-posts were pointed out to him as being submerged nearly to their tops as evidence that the lake was rising from the increase of rainfall. He simply asked them to wait for the development of time. In 1880 these posts were again uncovered, and the lake had receded to a lower point than it had been yet seen, although it had risen two feet more after 1867. He also spoke of the increase of floods by the cutting off of woods where a country was wooded, the minimum flow being made smaller and the maximum greater, and said the floods in Muskingum River were constantly increasing.

At 5:30 the session adjourned.

A public session was held at the Tabor Opera House in the evening. There were many ladies present.

Shortly after 8 o'clock Mr. Robert Stanton, of Denver, who acted as chairman of the meeting, arose and said:

"*Ladies and Gentlemen:* We are assembled here this evening to welcome the American Society of Civil Engineers to the city of Denver. I take great pleasure in introducing to you the Hon. Benjamin H. Eaton, Governor of the State of Colorado."

Governor Eaton said:

"To the American engineers—their science, skill, and energy—more than to any other cause, is due the rapid strides that civilization has made during the last half century. You have annihilated space and bid defiance to time. With iron bands you have connected ocean to ocean, and caused palaces to fly on wheels for our comfort and happiness. The world has been illuminated by the fire of your thoughts. Over thirty years ago I was holding a rod and carrying a chain under the direction of one of your honored members, Mr. Blickensderfer. Owing to a lull in railroad building, I took Horace Greeley's advice and started West to grow up with the country, never expecting to see Ohio's State Engineer again. A few years passed and I found him leading an iron horse across the great American desert and over our pathless mountains, and now he has charge of a herd of them. Judging the future by the past, the dawn of a grander life has begun. Our hope of the future is in you. Stand by your high calling. In behalf of the people of the State, I welcome you, and trust that the pleasures of your visit to

our commonwealth will be as an oasis; the shadow of a great rock in a weary land; a green spot on memory's brightest page."

In response the President of the Society, Mr. Flad, of St. Louis, replied, saying:

"I thank you for your kind words of welcome. We have come to your city because we wanted to see your great works, your mountain railroads, and irrigation works. Your kind welcome assures us that we were not mistaken. I again thank you."

Mr. Thomas Nichols, Acting Mayor of the city, welcomed the society in the name of the city.

The Vice-President of the society, Mr. Thomas C. Kiefer, of Montreal, Can., was then introduced. Mr. Kiefer's remarks were quite witty, and elicited considerable laughter from the audience.

Mr. R. W. Woodbury, President of the Denver Chamber of Commerce, was then introduced to the audience by the chairman, and said: "The ingenuity and the experience of centuries have built up a pinnacle of greatness, which the average man looks upon with awe and wonder. Few men reach the height and look down, but if there is one profession more than another whose members have reached it, I believe it to be that of the Civil Engineers. Most of us must be content with looking up at the pinnacle, and may need a glass to see the pinnacle and the engineer climbing toward its summit. If we cannot reach this height, we can at least welcome those who have; so it gives me great pleasure to welcome you in the name of the 450 business men who constitute the Chamber of Commerce and Board of Trade."

Mr. Green, of New York City, then, in behalf of the society, thanked the citizens of Denver for their reception. He said: "We are met on all sides with a cordial and generous welcome. Words fail me to express our pleasure and gratification in being here and our high appreciation of the welcome which you have extended to us. But I can assure you that we shall long remember our visit to the city at the base of the Rockies, a city surely destined to rank among the greatest—Denver."

President Henry Flad then delivered the president's address on "One Year of Engineering Progress." We give here an abstract:

"The field of engineering science has, of late years, become so extensive that the task imposed on your president of giving a summary of engineering progress during the year is one of considerable magnitude. It would be impracticable, within the limits of this address, to even enumerate all the important engineering works commenced or completed during the year; and to present simply a statement, giving the dimensions and cost of such works, would be of slight interest or benefit to the members of the society. I have, therefore, concluded that it would be preferable that I should mention the most important works only and devote a portion of this address to a statement of my individual views on such other matters as I judge to be for the well-being and progress of the profession. Even if some of my views should be shared by but few of those present, no harm can ensue, as, very properly, the society is not responsible for the individual opinions of its members. Furthermore, a departure from precedent to this extent, and from what may be termed the strict construction of the by-laws, will doubtless lead to more general consideration of the subjects to which I refer. There is another point on which I propose to depart from the beaten path. Instead of giving the greatest prominence to those works of the engineer which never fail to excite general admiration by being either the largest or the most difficult, or perhaps the most expensive, I propose to give the first consideration to that part of the work of the engineer which more directly influences the health and comfort of the human race. I will, therefore, commence by referring to municipal engineering, by which I mean those branches of engineering which provide abundant and pure water, good streets and safe buildings, and which keep pestilence from our dwellings by providing for the prompt removal of all offal and debris, or applying proper means for destroying their power to work harm. A liberal supply of wholesome water is an essential condition for health and comfort. Even the smallest towns are erecting water-works and the large cities are either extending their existing works or are engaged in investigating the best method of improving as well as increasing their supply of water. When the planning and construction of works of this kind is intrusted to experienced and skillful engineers, as is generally the case in our large cities, and when the usefulness of the engineer is not impaired by the interference of politicians or of another class of men that may be called 'amateur engineers,' the works are substantially con-

structed, with a view to economical operation, and with due regard to the necessities of the future. As regards water-works for small cities or villages or towns, the case is different. The engineer employed by the town rarely has any special knowledge of hydraulic engineering, and the mode generally adopted by the city authorities is to apply to one of the many water-works companies or syndicates, who undertake the planning and construction of works under a contract with the town, by which they guarantee a number of fire-streams of a fixed height at a certain price per annum, payable by the town, and also to supply water to the inhabitants at a rate agreed upon. It is but natural that in most cases the lowest bid will be accepted, and just as natural that the company or syndicate which obtains the franchise for the construction and operation of the works should plan the works with a view mainly to cheapness in first cost, and without any regard either to the quality of the water to be furnished, or to the permanency of the works. That under such a system, a good many of the water-works of our smaller cities should be more or less failures is hardly to be wondered at. There are a number of companies in this business who have a reputation to uphold, who employ competent engineers to plan and to construct the works which they have contracted for; but unless the city authorities should possess greater wisdom and knowledge of hydraulic works than they ordinarily are gifted with, some speculating syndicate will underbid, as it safely may, the responsible firm or company, and by building poor works will inflict a lasting injury on the community.

* * * * *

"Of new devices used in operating water-works I may call attention to the aeration of water, by means of air introduced into the pipes under pressure, for the purpose of destroying the organic germs, which otherwise might affect the salubrity or taste of the water. A new method of investigating the purity of potable water has also been introduced. It consists in observing the colonies of microbes which are produced in gelatine that has previously been sterilized. This method was first used in Berlin, and probably leads to more correct conclusions in regard to the salubrity of the water than any chemical analysis. As regards cleaning the water from solid matter carried in suspension, our country cannot claim to have reached the same high standard that obtains in other countries. American practice, in cases where the water is taken from turbid streams, generally provides only for removing so much of the matter held in suspension as will subside during a certain period of quiescence in settling-basins. Filtering, so largely used in England and on the Continent, is used here in but few instances. One reason why filtration is not more generally adopted probably lies in the fact that the quantity of water consumed per capita in this country is largely in excess of all legitimate requirements. Of late years the quantity per head has been reduced by various means adopted to prevent waste. If efforts in this direction are continued and are reasonably successful, measures for improving the quality of our potable waters will probably be more generally adopted. The most important and extensive works for the supply of water which are being carried on at present are those of New York, and Liverpool, England. The New York works are intended to provide an ultimate daily supply of 320,000,000 gallons. The main features are a masonry dam, 178 feet above the bed of the stream, and 1,300 feet in length, forming a lake which will contain 3,200,000,000 gallons. As the masonry of this dam has to be sunk more than 100 feet to each rock foundation, its total height will be nearly 300 feet, and its width at the bottom about 200 feet. The aqueduct, which is to carry the water to the Central Park Reservoir, is 31 miles in length, and of an average diameter of 12 feet. It crosses the Harlem River by an inverted siphon, 150 feet below the surface of water. The construction of the aqueduct is rapidly progressing. Of similar character, and of hardly less magnitude, are the works for the supply of water to Liverpool. The Vyrnwy Dam, of cyclopean masonry, is to be 136 feet high in the centre, 1,258 feet in length and 117 feet thick in its widest part. The impounded water will cover 1,118 acres. Fears have been expressed as to the safety of this structure, but thorough investigation by competent engineers has proven that such fears were unfounded. The aqueduct will be thirty-five miles in length.

* * * * *

"The removal and disposal of human excreta and of the waste water from dwellings and factories present greater difficulties than that of any other kind of refuse. The sys-

tem of water-carriage evidently is the only way practicable, in a country where the water-closet is so generally used as in the United States. Whether the sewage proper should be taken into the conduits, which, in most cities, it is necessary to construct to carry off storm water, or whether the sewage should be carried off separately; in other words, whether a combined or separate system of sewerage should, for any particular city or town, be chosen, cannot be properly determined without thoroughly weighing the advantages and disadvantages of either system, as applied to the particular place requiring the improvement. To insist that one of these systems should be exclusively used in all cases is, in my opinion, a position that no competent engineer ought to assume. Instead of entering into a discussion of the different methods used for finally disposing of the sewage under the *separate systems*, I will state that from the facts, given in an excellent report by Eliot C. Clark, M. Am. Soc. C. E., on this subject, I am inclined to believe that the filtration of sewage, by allowing it to flow over large areas of underdrained land, as is practiced with perfect success in many towns in England, and which has also been successfully introduced at the city of Pullman, Ill., is the most certain and most generally applicable method. Speaking of the disposal of refuse matter, I will mention that the burning of street sweepings and offal, in ovens constructed for the purpose, is successfully and economically carried on at Leeds, England, and to express the hope that this example will soon be imitated in our own country. But this can be accomplished only when the street-pavements are constructed of material which is not readily abraded by the effects of traffic. The necessity of procuring pavements of this kind is fully recognized, and the streets of Paris, London, Berlin, Vienna, New York, Boston, Chicago, St. Louis, Baltimore, Cincinnati, and Washington are now nearly all being paved with the same kinds of material, and under almost identical specifications. Granite blocks, wooden blocks, and monolithic asphaltum are almost exclusively used in the principal streets of these cities. The granite pavement is the most durable and requires the least repairs; the monolithic asphaltum takes precedence from a sanitary point of view, and the pavement made of blocks of wood, as lately constructed, is preferred by some on account of its being the easiest on horses and least noisy. But it still remains for the engineer to devise a pavement, durable and smooth, for use on streets where the traffic is light, or where the cost of granite, or even either of the two other pavements above mentioned, precludes their application. Macadam pavements, when good stone can be obtained, will, under proper treatment, give a smooth surface, agreeable for travel, provided they are kept in first-class order by the immediate repair of any defect. But this is a condition which can hardly be realized in this country, on account of the high price of labor. Street-pavements of hard-burnt brick are now being tried on a large scale in Galesburg, Bloomington, Jacksonville, and other towns in Illinois. At Bloomington this pavement has been in use since 1876. Blocks of what is called ceramite (a composition of coal-tar, pitch, and sand) have been used for street-pavements at Buda-Pesth since 1881. The general mode of construction in both cases is the same. Street-pavement composed of round cedar blocks has been largely introduced in Western cities of late years, but can hardly be considered to fill all the conditions required for a good pavement on account of its unequal wear. Among those things which affect the health and comfort of the inhabitants of cities using bituminous coal, is the nuisance due to smoke. Many appliances for smoke prevention have been devised, and ordinances passed, with a view of remedying the evil. Some of these appliances are reasonably successful. Their application mitigates the evil, if it does not wholly remove it; but it is to be hoped that the experience gained at points where natural-gas has been found and applied to heating purposes, and the late improvements in the manufacture of heating-gas, will, before long, lead our people to abandon the primitive mode of using solid fuel now in vogue, and depend exclusively on gas for heating purposes.

"Another source of complaint, in our large cities at least, is the obstruction by poles and wires used in the business of distributing electricity for the various purposes to which it is now applied.

* * * * *

"I am inclined to think that, what may be designated as the mixed system would be the most satisfactory, under which large subways would be used on streets where the number of electric conductors, and of pipe lines required for all purposes, was sufficient to warrant the expenditure

for such structures, while, for the other streets, a system of aerial carriage and distribution might be devised which would be free from the gravest objections to the present practice, and which would admit of gradual expansion, without interrupting traffic, until the proper time for the construction of a subway had arrived.

* * * * *

"The greatest obstacles to the proper conduct of public work in cities and villages arise from the fact that the engineer is frequently selected from political preferences, which often gives the position to an incompetent man, and another obstacle is that the term of office is generally by law limited to one or two years, and does not allow enough time to even a competent engineer to become thoroughly acquainted with his duties, and with the distinctive features and requirements of the locality, before he is liable to be displaced. If the evils arising from such a state of affairs are to be avoided, appointments should be based on strict civil service principles. No person should be appointed on any other ground than that of competency and honesty, and he should hold his office during good behavior, and all subordinates should be selected on the same principles. Some of our larger cities tried to remedy the evil by placing the general management in the hands of boards of commissioners generally selected from among prominent business men in the community.

"This system has been an improvement on the old one. But this has the disadvantage that it provides for what might be designated as "figure-heads," whose duties might just as well be performed by the engineers intrusted with the planning and execution of the public works. To make a board of public works thoroughly useful and inexpensive its members should mainly be selected from among engineers, each of whom is to take charge of a particular department, performing the duties of chief engineer of such department, while at the same time the board gets the benefit of his special information, and also of his general knowledge of engineering matters. St. Louis, Providence, and Milwaukee have partially adopted this system, and it is to be hoped that other cities will follow their example.

"In connection with this subject I am pleased to record the fact that in some cities positions on public works are now made dependent upon the result of examinations, held under civil service rules."

Mr. Flad then gave a resume of the progress of railway and canal construction, of works of irrigation and river improvements, of tunnel projects, military engineering, and bridge construction. He discussed the importance of tests of materials, and hoped the United States Government could be induced to erect, in addition to the Watertown testing-machine, others of smaller dimensions, and appropriate amounts sufficient to pay for tests, not of special, but general interest, and for the time of the engineers specially charged with the work. He referred to the tests of cements, etc., made by members of the society, and devoted considerable attention to the metric system, expressing the belief that its advantages would lead to its general adoption. He referred to the reports and papers published during the year, and, on conclusion, said:

"I may congratulate you upon the rapid growth of the society, both in numbers and in influence. Since July 1, 1885, 94 members have been elected and have qualified; 57 full members, 9 associates, 24 juniors, 4 fellow, and the society has lost 16 members—5 by death, 4 resigned, and 4 were dropped. It has also lost 2 associates, 1 by death and 1 by resignation, and 1 fellow by death. The total membership now in the country is 981, of which 732 are full, 41 associate, 100 juniors, 57 fellows. There are 40 subscribers to the building fund, 8 honorary members, and 3 corresponding members. Our society is far behind the Institution of Civil Engineers as to numbers, and probably even more so as regards influence, but this is mainly due to the fact that English capital has been largely employed in the English colonies and in foreign countries in enterprises managed by English engineers, while our capital and the services of our own engineers were, until lately, almost exclusively needed at home, and to the further fact that the English people hold the profession, which produced some of their greatest men, such as Watt, Smeaton, and Stephenson, in higher esteem than has been the wont of our own fellow-countrymen. But our country is getting both richer and wiser every day, and I hope the time is near at hand when our engineers will attain a wider sphere of action, and receive both public esteem and proper compensation. Those of us who have seen engineering, as a

profession, start into life in the United States, may not see that hope realized, but we have the satisfaction of knowing that we have earnestly striven for the attainment of this end."

It was announced that a drive about the city had been arranged for the following morning, and the session then adjourned to meet on the afternoon of July 3.

The second day's session was held in the Chamber of Commerce. Invitations to the members were given by the United States Electric Company to visit their works, and by the Argo and Grant Smelting Companies to visit the smelters.

The secretary announced the excursions of the following week: Tuesday the society would go to Georgetown and Silver Plume over the Colorado Central Railroad, and on Wednesday to Greeley to inspect the irrigation system in that vicinity. On Thursday an excursion would be made to Leadville over the South Park, and leaving Leadville Friday morning the party would go out over the Rio Grande to Salida and thence to Marshall Pass, and thence to Pueblo, Colorado Springs, and Manitou. Saturday and Sunday would be spent at Manitou, and on Monday the party's special car will leave Denver and meet the party at Colorado Springs for the home trip.

The paper of the session was by Mr. A. M. Wellington, formerly Chief Engineer of the American Railroad from Vera Cruz to the City of Mexico, on that line, with notes on the best methods of surmounting high elevations by rail. It was largely descriptive of the country through which the line described ran, showing the peculiar difficulties of locating a railroad line where the mountain passes rose up very suddenly from but little above sea-level to a height of 8,000 feet, and of the inductive method by which he was enabled to discover and reconnoitre a line having an average grade of two per cent. through a most difficult country in about six days.

The paper was preliminary to the introduction of a proposition to use in such cases the old device of switch-backs. Mr. Wellington claimed that by making the tails of these with a rapid and increasing rise they would be elements of safety, and in addition would frequently allow the line to be thrown up quickly so as to reach better ground, and secure a large saving in first cost.

The discussion in the evening was keen and sharp, and was participated in by Professors Woodward and Watson, Mr. Cohen, Mr. Moore, and others. The members visited, after the afternoon session, the new electric railway line, which was looked upon as a very promising invention. The cost per mile is placed at about \$16,000, as against over \$100,000 for cable roads. Three miles are now constructed, but not in operation, and twelve more are contemplated immediately.

At the evening session the Denver Circle Railway extended an invitation to the society to ride over its road without cost. Mr. H. C. Lowrie, City Engineer, wanted the members to call on him at the City Hall.

A paper was read by Mr. Croes on "Excessive Rain-falls" for the author, Mr. Foster Flagg. It described unusually heavy rainfall in the Hebrides Islands in 1880, investigated by the writer.

After announcement of Monday's meetings, the session adjourned.

On Monday, July 5, the first thing in the morning was a visit of inspection of a new flushing system by Mr. Lowrie. At ten o'clock Prof. A. A. Julien's paper on "Building Stones" was read. It was quite lengthy and contained tables of compressive strength, amount of compression under loads, strength under transverse strain, and deflection under a sledge. His experiments show conclusively that there is a decided difference in strength of specimens cut by chisels or sawing, the latter being the stronger. He also showed that the conditions as to amount of moisture contained made variations up to fifty per cent, in some cases, and it is necessary to dry all specimens to insure comparable results. He found also that some stones are stronger on their edges than on their beds. He criticises quick testing as giving much too high results, sometimes up to thirty-seven per cent. in specimens he tested. These experiments show that nearly all previous experiments are based on erroneous methods and not to be relied upon without large allowances.

A paper by Mr. Noble on use of cement-mortars in cold weather, the thermometer going down to 28° below zero, showed that in such cases Portland cement was less affected than Louisville natural cement.

In connection with this a report of progress from Committee on Tests of Cement-Mortars, etc., for amount of compression under loads was read by F. Collingwood, Chairman, including appendixes from Professor Swain and Captain Maclay, of the committee.

An interesting paper on a "New Application of the Polar Planimeter," by C. E. Emery, was next read. Also were read a paper on the "Compressive Strength of Steel and Iron," by C. A. Marshall, and a paper on "Repairs of Davis Levee Crevasse," by G. F. Lewis.

The secretary read a letter from Hon. E. B. Washburn, of Illinois, confirming the invitation extended to the society by the President of the American exhibition to be held in London next year.

The paper was laid on the table, with instructions to the secretary to extend the thanks of the society.

The committee to consider changes in organization was called upon, but had no report to make. The committee was then discharged.

The Committee on Joint Libraries made no report.

The committee to consider the proper relation to each other of the sections of railway-wheels and rails was then called upon. This committee also failed to report.

A resolution was presented by Mr. Morrison, and carried, with regard to the rules for carrying on the business of the society, for the reading and discussing of papers, etc. The following gentlemen were named as the Nominating Committee:

H. Stanley Goodwin, Bethlehem, Pa.; R. B. Stanton, Denver; Desmond Fitzgerald, Boston; B. M. Harrod, New Orleans. This committee is to report on the first of November next.

Papers were then read on "The Laying of Masonry in Cold Weather," by A. Noble, and "The Strength of Iron and Steel," by C. H. Marshall.

Mr. Morrison gave an interesting description of two voyages across the ocean, looked at from a scientific point of view.

On Monday evening a delightful reception was held at Windsor Hotel, many citizens and ladies from Denver participating. On Tuesday there was an excursion to Greeley to examine irrigation-works, and on Wednesday an excursion to Georgetown and Silver Plume to see the Clear Creek Cañon and the very interesting loop line of the railroad above Georgetown.

REPORT OF THE WATER-POWER OF THE UNITED STATES.*

THIS is the sixteenth volume of the tenth census, and the work of preparation has been carried out under the general direction of Prof. W. P. Trowbridge. The explorations, reconnaissances, etc., have been made by Prof. George F. Swain, C. E., of the Massachusetts Institute of Technology; Mr. James L. Greenleaf, C. E., of the School of Mines, Columbia College; and Mr. Dwight Porter, C. E., of the Sheffield Scientific School, Yale College. The plan of the work is to consider the streams of the country by sections according to the location of their outlets. The water-powers treated in Part I. are as follows: Of the streams of Eastern New England, those tributary to Long Island Sound, to the Hudson River Basin, and of Lake George outlet, to Lake Ontario and of New York State Canals, to Lakes Huron and Erie, and of Niagara Falls and River, of the Middle Atlantic Water-Shed, of the Southern Atlantic Water-Shed, and of the Eastern Gulf Slope.

In each of these divisions the method pursued is to consider, first, the general characteristics of the whole region, area, form, topography, location, geology, soil, climate, rainfall, and the flow of streams, with their total power. Then follow maps of the drainage basins, and in each every river is separately considered. Its tributaries are given with the water-shed of each, its declivity through its various reaches, tables of the various storage reservoirs and dams and their capacity, and of the amount of power utilized at each, with sections and plans of many of the largest dams and their location.

The general introduction occupies the first twenty-nine pages. It has been prepared with great care by Prof. Swain, and we propose to consider it at some length. He shows that the total theoretical water-power of the United States reaches "the enormous figure of over two hundred million horse-power." Of course a large portion of this can never be made available; as, for example, the power of

* Report of the Water-Power of the United States. Part I. Washington: Government Printing Office. 1885. With plates. Quarto.

the Mississippi alone, below Cairo, is some six per cent. of the whole. The increase in the use of water-power has been about $8\frac{1}{2}$ per cent. in the last decade, while steam-power has increased eighty per cent., the totals of each being in 1880, respectively, 1,225,379 for water, and 2,185,458 for steam.

Tables are given showing the total power by States and Territories. New York stands first in total water-power used, but eighth in power per square mile, showing 4.61 horse-power per square mile; while Rhode Island, which is sixteenth in total power, has $20\frac{1}{2}$ horse-power per square mile, and is first in this respect.

Nearly two-thirds of all the utilized water-power of the country is in the Northern Atlantic States, New England alone having a little over one-third. About thirty-eight per cent. of the power utilized is used by grist and flouring mills, twenty-three per cent. by saw-mills, twelve per cent. by cotton-mills, seven per cent. by paper-mills, and four per cent. by woolen mills.

The report shows that water-power is generally cheaper than steam-power, but since the factory must be brought to the power, considerations of access, permanence, and facilities for transportation often cause steam to be used in preference.

A table is given of the slope of the principal streams flowing into the Atlantic and the eastern Gulf. "Topographically, the principal distinction to be drawn on the Atlantic slope of the Appalachian chain is, that the streams south of Virginia take their rise and complete their course entirely on the eastern flank of the Alleghenies, while from North Carolina to New York they gradually penetrate farther and farther into the mountains, until the sources of the Susquehanna, Delaware, and Hudson are found quite on the other side of the system, on the western plateau, from which they cut through the entire system to the sea. In New England the mountains are more detached and isolated, but the water-shed line runs in general along their western flank." The coast in New England is abrupt, with deep water immediately off shore. The metamorphic rocks "give rise to a greater number of concentrated falls than anywhere else on the Atlantic slope. In the Southern States abrupt falls are less frequent, although they often occur. The falls of the large rivers are, for the most part in the shape of long shoals or rapids, the bed being gravel or boulders."

"In the middle Atlantic slope, owing in part to the topography and partly to the softer character of the rocks, the slopes are more gradual, and abrupt falls are rare."

The expense of utilizing powers on the middle and south Atlantic slopes is therefore great, owing to their uniform slope and great width, and among these streams the Susquehanna is prominent as offering not a single large utilized power.

The slopes given on what are called the *working* portions of some of the rivers mentioned in the table are as follows: $2\frac{1}{8}$ feet per mile on the Susquehanna, $3\frac{1}{8}$ feet on the Mohawk, $3\frac{1}{8}$ feet on the Chattahoochee, $4\frac{1}{2}$ feet on the James, $6\frac{1}{8}$ feet on the Connecticut, $8\frac{1}{8}$ feet on the Penobscot, $10\frac{1}{8}$ feet on the Hudson.

As to the *volume* of the streams in question, they are more variable, freshets more violent, and the low-season flow smaller, in general, as we proceed southward from New England.

This is due in the first place to the large lakes as feeders, and the numerous storage reservoirs in New England, which are lacking farther south; second, to the differences in topography; and, in the third place, "the rainfall in New England and in parts of the Middle States is distributed with a greater quantity in summer and autumn than in winter and spring" (which is the reverse of that in States south of Pennsylvania and Maryland), and helps to make up for droughts by evaporation, etc., in the summer months.

The Southern streams are free from ice freshets, but, nevertheless, "are subject in places to rises far exceeding anything on record in New England." For example, the highest rises in New England are twenty-five to thirty feet, the Delaware forty-two feet, the Shenandoah forty feet, the Roanoke fifty feet, the Coosa in Alabama fifty-four feet, etc.

The Southern streams have their powers at a much greater distance from tide-water, and they are therefore not so readily accessible, and in all respects, therefore, the water-powers of New England are the most available.

Considering next the tributaries of the Ohio, the watershed in Pennsylvania reaches at some places in Pennsylvania to heights of 2,000 feet or more, and the principal

streams have an average slope of ten feet per mile. In the *lower* part of their course these streams have falls of 0.34 of a foot for the Green River in Kentucky to 2.84 feet for the Allegheny from Olean in New York. The southern tributaries have generally less fall than the northern, the fall of the latter varying from one to four feet, making them "every way better for the development of power."

The proportion of the rainfall discharged from the entire Ohio Valley is estimated at twenty-four per cent. This is owing to the deep soil, the permeable strata, and the openness of the country. The rainfall is generally "much less in autumn than in any other season, and less in summer and autumn than in winter and spring, especially in the southern part of the basin. This fact, with the absence of lakes and character of the country, etc., explains the variable discharge." The disadvantages for power are, extreme low water in summer and autumn, heavy freshets and ice runs, long continued back water, and troublesome foundations on account of absence of rock. There is room, however, for a considerably greater development.

The streams flowing into Lake Ontario furnish some important powers fully described in the main report. Those flowing into Lake Erie and those draining the Peninsula of Michigan furnish no powers larger than 1,000 horse-power.

The Niagara falls in thirty-seven miles through a height of 333 feet, developing a total of six million horse-power, or more than five times the total amount in use in the United States in 1880.

The eastern tributaries of the Mississippi are much like the northern of the Ohio. At the headwaters in the Northwest is a rough and ragged country at 600 to 1,600 feet above tide, with large slopes to the streams. The most marked feature is the great number of lakes, by which the flow of the streams is regulated to a large extent. The absolute amount of rainfall is small (twenty-five to thirty-five inches), but its favorable distribution as to time, together with extensive forests, and the lakes, etc., referred to, make the water-powers almost comparable with those in New England. For example, the Lower Fox River, the outlet of Lake Winnebago, falls 170 feet in $37\frac{1}{2}$ miles, affording twelve large powers, with an aggregate of 46,000 horse-power at ordinary low water.

The streams flowing into Lake Michigan on the south—the Milwaukee, Sheboygan, and Manitowoc—have slopes of about eight feet per mile. Further north, in northern Wisconsin, Michigan, and Minnesota, the streams descend more rapidly, but in a wild and at present inaccessible country.

The Menominee falls 970 feet in 160 miles, "descending in rapids and cataracts over ledges of upturned rock," but has few lakes to regulate its flow.

"Along the southern shore of Lake Superior the watershed lies at an elevation of 600 to 1,050 feet above the lake, and at about thirty miles distant," and, owing to the hardness of the rock, the streams though short carry considerable quantities of water.

The estimated available power at ordinary low-water of the St. Louis River, for example, is 50,000 horse-power. The rainfall in this region is thirty to thirty-five inches, and the flow per square mile is estimated at 0.4 of a cubic foot per second.

To the west of the Mississippi lies the Red River of the North, flowing northward from Breckenridge to the national boundary, with a fall of about 0.4 of a foot per mile for 394 miles. Above Breckenridge the fall is eleven feet per mile, and the eastern tributaries descending from the hill country of Minnesota and fed by lakes furnish all the available power of the basin. On the western tributaries the rainfall is but about fifteen inches, and the open character of the basin, large evaporation, small fall of the streams, etc., render their flow variable and of no value for power.

At Breckenridge the flow is from 4,747 square miles with an ordinary low-water average of 0.217 of a cubic foot per second per square mile and very uniform; while in its lower course, owing to its altered character and climatic differences, it is subject to tremendous floods, and the low-water flow from the whole basin falls to 0.07 of a cubic foot per second per square mile.

The chief power of the Mississippi is found on its upper portion and the tributaries there entering it. In a distance of 500 miles the fall is about 1,000 feet, furnishing some important powers. That at Minneapolis is stated to be a minimum of 25,000 horse-power. There is but one power on the main river below St. Paul.

Its western tributaries are for the most part prairie streams, the slope being very uniform at the rate of two to five feet per mile.

Owing to their position east of the great mountain chains which drain out all the moisture from the winds, the rainfall, which at St. Louis is $40\frac{1}{8}$ inches, diminishes as we proceed westward, until at Fort Bridger in Wyoming it is but $8\frac{1}{8}$ inches, while at most points west of the 90th meridian it is less than twenty inches. Many of the streams dry up entirely during the dry season, and some of the largest fall to a low-water flow of 0.05 to 0.1 of a cubic foot per square mile per second. Even the Missouri itself, draining 500,000 square miles, has fallen to as low as a flow of 0.05.

So far as *fall* is concerned, some of these streams "compare favorably with streams on the Atlantic Coast, but the absence of concentrated falls, their variable flow and shifting bed render them far inferior as sources of power."

The tributaries of the Mississippi from Eastern Iowa furnish some important powers, but none larger than 1,200 to 1,300 horse-power at low water in ordinarily dry years.

The Arkansas and Red Rivers furnish no important powers.

No details are given of streams on the Western Coast.

A table is next given of the principal streams named, with drainage area, rainfall by seasons, and annual maximum and minimum extremes of flow and ratio, minimum and ordinary flow per second per square mile, and total cubic feet per second at ordinary flow. Next is a table of the large developed powers, with length and height of dam, total fall, total theoretical power, and fall and power utilized. Next is a table of large undeveloped powers, with fall, etc. Next a table of *cost* of water-power, with locality, available power, rates for power, and methods of regulating power; and, lastly, a table of power utilized by canals, and of the power utilized in the several drainage basins.

The remainder of the volume is taken up with full details, of which this is a synopsis, and contains a large amount of valuable information.

Correspondence.

ARRANGEMENT OF APPARATUS FOR USING EXHAUST STEAM FOR HEATING.

SOUTH BETHLEHEM, PA., June 16, 1886.

SIR: I have been considering the question of exhaust steam-heating, and have concluded that a job of exhaust steam, erected as for low-pressure only, instead of using ordinary radiators, to use coils of $1\frac{1}{4}$ -inch pipe with manifolds, would be about as satisfactory as could be arranged for a large building, the coils to be placed upon the walls beneath the windows. This job could then be used for direct heating from the boiler when engine is not running, or if engine does not furnish enough steam it can be assisted from boiler. The condensation to be trapped with an inverted syphon for exhaust steam, and with float-trap for live steam, using an ordinary back-pressure valve upon the job; and considering that the power of an engine cannot represent more than one-quarter the value of the coal, I consider that from two to four pounds back-pressure would still be a vast economy, as it would only represent about one per cent. of the coal-pile. Hoping to hear some comments upon the same through your columns, I am,

H. A. R. D.

[Radiators cannot be used to good advantage with exhaust steam.

One and one-quarter-inch pipe and headers will make good exhaust-steam coils, and, unless the coils are very long, 1-inch pipe will be about as satisfactory for equal surface.

The exhaust steam from an engine may be turned into coils with a small loss to the engine in back-pressure of about 4 per cent. to vary according to the back-pressure used.

When the steam from an engine represents only one-quarter of all that a heating apparatus will condense, it is better to use no back-pressure valve, but instead to have a means of passing the steam to the roof in summer, and another to pass it into the coils in winter. This will prevent the loss of live steam through a back-pressure valve. On the other hand, when the engine exhausts more steam than the pipes will condense, a back-pressure valve is a necessity.

The saving due to the use of exhaust-steam is about equivalent to 90 per cent. of the coal used to run the engine. In other words, if a whole establishment used one ton of coal in the day—1,500 pounds for heating and 500

pounds for an engine—and if they then turn the exhaust steam from the engine into the pipes, they will do both duties with about 1,550 pounds of coal, instead of the 2,000 pounds used before, provided all is properly arranged.

Frequently these apparatus are mortifying failures, because they have been done without a due appreciation of all that is involved.]

HEALTH MATTERS IN ONTARIO.

(From our Special Correspondent.)

THE city of Toronto has voted a sufficient sum for the erection of four beehive garbage-destructors with chimneys. Two are to be erected at once, the sites have been chosen in the east and west parts, and the other two are to be erected hereafter in the north-east and north-west parts of the city.

The preparations for the meeting of the American Public Health Association are progressing satisfactorily. There are indications of a good representation of British sanitarians.

A by-law to regulate and license the practice of plumbing is now occupying the attention of the City Solicitor.

The Hon. Mr. McAlpine's report on the important question of a trunk sewer is expected about the end of the month. Numerous float observations have been taken at the proposed outfalls to establish the currents in the deep water of the lake during the past two months, but they require to be continued till the fall to be of practical benefit. We hope the City Engineer will be able to order this to be done.

IF "Plumber," of Baltimore, will carefully read the advertisements of the Book Department of THE SANITARY ENGINEER, he will see that books are sent prepaid on receipt of the advertised price.

Gas and Electricity.

Illuminating Power of Gas in New York City.

Week ending	New York Gas-Light Company.	Manhattan Gas-Light Company.	Metropolitan Gas-Light Company.	Mutual Gas-Light Company.	Municipal Gas-Light Company.	Krickerbocker Gas-Light Company.	Equitable Gas-Light Company.
July 10.	27.45	22.72	21.24	28.94	30.96	22.42	32.07

E. G. LOVE, Ph.D., *Gas Examiner.*

LIGHTNING-RODS.

CHARLESTON, S. C., June 28, 1886.

SIR: I notice your reply to A. B. C., in your paper of the 24th inst., in reference to lightning-rods.

You state that glass insulators are dangerous.

I would beg to mention the following facts:

We have a great many buildings in this city with lightning-rods. Very many of these rods are put up with glass insulators, but several buildings have still the old-fashioned 1-inch square iron rod secured to the walls with ¼-inch iron staples without any insulation.

Now I know of two buildings with this old-style rod that were struck by lightning, and in both instances the current left the rod and followed the staples, and considerable damage was done to the buildings. I have yet to hear of a single instance where any damage was done where rods with glass insulators were used. If glass insulators are dangerous, why do all the electric-light, telegraph, and telephone companies use them on their wires?

I would be glad to have you reply to the above in your valuable paper. Yours truly, X. Y. Z.

[We think the buildings provided with the old-fashioned rods were struck, not because they did not have glass insulators, but because the ground-connection and possibly the rod itself were defective. The ground-connection is a very important part of a lightning-rod, and one to which sufficient attention is not always paid. Where the electricity follows a staple instead of the conductor, it is pretty clear that there is something faulty with the latter below the staple. The great majority of evidence goes to show that insulators are useless, or worse. This was the conclusion of the Lightning-Rod Conference, composed of members of the Meteorological Society, the Royal Institute of British

Architects, the Society of Telegraph Engineers, and the Physical Society of England. If our correspondent wishes to inquire further into this matter, we refer him to the report of the conference mentioned, published in 1882, and also to Anderson's "Lightning-Conductors," 3d. Ed., 1885. Electric-light, telegraph, and telephone companies employ dynamical electricity, while that of lightning has the properties of frictional electricity.—ED. SAN. ENG.]

THE South Metropolitan Gas Company, of London, has had to pay £1,100 damages in consequence of an explosion caused by the igniting of gas which found its way into a dwelling from a broken main. The main was in an unfinished street for the purpose of lighting public lamps, and it appears was properly laid by the company. Other parties, however, removed sand and gravel from beneath the main and substituted rubbish, which could not sustain the main, and it broke. While no negligence on the part of the company was proved, the jury found for the plaintiffs as above stated.

NEW organizations are the Hydro-Carbon Gas Company of Pennsylvania, of Camden, N. J., with a capital stock of \$500,000, and the Delaware Gas Company, of Chester, Pa., with a capital stock of \$5,000.

THE gas-stove manager of the Glasgow Gas Committee reports that 2,417 stoves had been sold, and 2,642 more had been hired by consumers, a total of 5,059.

A FRESH proof of the growing popularity of the electric light in Paris is to be found in the fact that some interesting experiments are just now being made to light the hospitals there by electricity. A few of these institutions have already been furnished with an installation of incandescent lamps, not only in the operating theatres, but in the sick wards, with such satisfactory results, from a hygienic point of view, that there is little doubt that before long the system will be generally adopted by the *Administration de l'Assistance publique*.—*Electrician*.

THE authorities of the Toledo, O., Insane Asylum intend to light the Asylum Buildings with electric-lamps, and ask for proposals until August 2. The appropriation available is \$18,000.

THE Cleveland, O., Committee on Lighting want to get the price of gas reduced from \$1 per 1,000 cubic feet to 75 cents.

THE Senate Committee to inquire into the relation of the gas companies of Washington, D. C., to consumers has reported that \$1 per 1,000 cubic feet will enable the companies to make a profit of seven per cent. on their capital, and recommending that this be the price; also, that a more thorough inspection of the quality of gas be instituted, with provision for the summary exercise of power by some authority to exercise such inspection.

Reviews of Books and Pamphlets.

POOR'S DIRECTORY OF RAILWAY OFFICIALS AND RAILWAY DIRECTORS. 1886. Containing lists of the directors and officers of all railways in North America, and of the leading organizations auxiliary to the railway system, etc., etc. Published by H. V. & H. W. Poor (Poor's Railway Manual), 70 Wall Street, New York City. Pages, exclusive of advts., 387. Price \$2.00.

The publishers of Poor's Standard Railway Manual learned that a want existed for as full and accurate lists as possible of the men connected with the railway system. This publication is the first of an annual series to supply that information. From a study of it we should say it is surprisingly complete, and will be of great service to all business interests which wish to know the addresses of American railway men. The book contains, it is claimed, the names and addresses of all officials of every railroad in the United States, and also North and South America, the West Indies, Great Britain, and Ireland, including engineers, master mechanics, and roadmasters. It also gives a list of railroad contractors, and of firms manufacturing supplies for railroad purposes, as well as an alphabetical list of railroad directors.

If the work is as accurate as it seems to be full, it must be very useful to many business men.

The price of the annual (\$2) includes a quarterly supplement of changes and additions.

NINETEENTH ANNUAL REPORT OF THE HEALTH DEPARTMENT OF THE CITY OF CINCINNATI for the year 1885. 129 pp., 8vo. Cincinnati. 1886.

The Health Officer of Cincinnati, Dr. C. W. Rowland, bases his calculation of the death-rate for the year on an estimated mean population of 325,000, giving a mortality of 18.37 per 1,000. In the different wards of the city the estimated death-rates vary from 10.8 to 21.6 per 1,000—that is to say, the mortality in some parts of the city is double that of others. Out of a total of 5,973 deaths,

consumption caused 855, or 14.3 per cent.; pneumonia, 586, or 9.8 per cent.; diarrhoeal diseases, 639; typhoid fever, 122; diphtheria, 100; and croup 115 deaths.

The report contains very little information as to the water-supply, the sewerage, the streets, or the public buildings of the city. It is again recommended that the water-works be moved from their present location, and the remark is made that the sewerage system should be pushed by the city as rapidly as the means can be furnished.

Physicians are required to report contagious disease under penalty of fifty dollars fine. It seems, however, that this threat is not sufficient, and Dr. Rowland un- wisely asks for legislation making failure to report such cases a criminal offense.

The report contains a complete collection of the laws and ordinances relating to the Health Department, and is specially valuable on that account.

REPORT ON THE WORKS EXECUTED BY THE HONORABLE, THE COMMISSIONERS OF SEWERS OF THE CITY OF LONDON, DURING THE YEAR 1885. By William Haywood, Engineer and Surveyor.

The works entrusted to this commission are not those of the modern city, but only those within the restricted area of the old city. The report is interesting as showing the wide range of authority conferred upon the commission. Only 472 feet of sewers were constructed.

The Surveyors of Buildings reported to them upon 69 cases, in eight of which the buildings were shored up.

A considerable portion of the report is taken up with records of street widenings and straightenings, brought about by purchase and by negotiation, in which such well-known names as Wood Street, Eastcheap, Old Broad Street, Fenchurch Street, Cloak Lane, Queen Street, Amen Corner, etc., figure.

A list of streets is given in which the carriageways have been laid with Val de Travers compressed asphalt, with Limmer compressed asphalt, and with compressed asphalt of the Societe Francaise des Asphaltes. Also with wood by the Improved Wood-Pavement Company, with Mowlein's wood pavement, and with granite. Other contractors who laid wooden pavements during thirteen years past have either become bankrupts, "or failed to carry out their contracts, a result probably attributable to their having taken work at prices at which they could not execute and maintain it at a reasonable profit."

Lists of foot-pavements laid down are also given.

The lighting of street-lamps cost at the rate of sixty-two cents per thousand feet for gas, and an annual charge of \$3.75 per lamp for lighting, and seventy-five cents to \$1.81 for cleaning and repairing. The quantity burned is determined by thirty-six meters attached to lamps in various localities.

Electric-lighting is still in abeyance, and the Commission attribute this condition of things to the operation of the Electric-Lighting Act, by which such enterprises are so fettered as to hinder capitalists from embarking in them.

Public urinals are reported upon, and the successful introduction of an underground building for this purpose, in the centre of the carriageway of the crowded thoroughfares at the junction of Eastcheap and Gracechurch Streets, commented upon. Experience has shown "that the privilege of a free usage was greatly abused; since then a fee of one penny has been charged for the use of each water-closet." The structures are kept open from 8 A. M. to 8 P. M., and three attendants are present. The water-closets were used 229 times daily, and the urinals 6,000 times. Similar accommodations are to be provided at two other points.

Streets are swept once daily, and the main thoroughfares a second time in wet weather. But there is a continuous cleansing by 150 boys, called street orderlies, through the busy hours of the day. The cleaning begins often as early as two o'clock in the morning; and late in the evening, after the orderlies have left, the carriage pavements are washed, if necessary, 2,700,000 gallons of water having been thus used in the year. Sidewalks are swept when needed, or cleansed by squeegees during wet weather. Courts and alleys are washed twice a week, and some of them nightly. Sand and gravel are strewn upon the streets having the heaviest traffic, and all snow is removed from the streets.

A destructor for burning street refuse has been in operation for about nine months, but not with the full success anticipated. The clinkers have been unsalable, as the material does not seem so well fitted for mortar as that obtained from destructors in northern towns.

There were 5,902 interments in the city cemetery.

Five blocks of artisans' dwellings in Petticoat Square were opened during the year. There has been difficulty in renting the upper floors, and also the shops and basements. The rentals on the first have been reduced, and as the shops are large, permission has been given to divide them. As to the stores, it is thought that their non-rental is due "to the police preventing the owners of stalls from standing in Harrow Alley and Stoney Lane, and also to the interference with trading on Sunday" (the community being largely Jews). The report, therefore, recommends that stalls be allowed on the footways and a part of the carriageways, as has been the custom for generations.

Subways are discussed, and Parliament is to be petitioned for power to construct them where eminently needed. Of the new bridge crossing Queen Victoria Street, it is pleasant to read, "the bridge is not to be used for the purpose of general advertisement." The bewildering effect of the mass of advertisements at all railway-stations in England upon the unlucky traveler who is trying to discover the name of the station is well-known to American tourists.

Patents.

No. 343,139 is a patent for a steam-injector, issued to William Penberthy, of Leadville, Col., assignor to the Penberthy Injector Company, Detroit, Mich., for the lifting, combining, and delivery tubes comprising a tapered combining-tube having an outer screw-threaded surface, the lifting-tube having an apertured lantern shaped portion correspondingly screw-threaded on its inner surface at one end, the delivery-tube integral with said combining-tube, and lateral outlets or passages formed between said combining and delivery tubes.

No. 343,172 is a patent for an exhaust for water-closets, issued to Patrick Harvey, of Chicago, Ill., for the combination, of a syphon leading from the bowl, the trap between the syphon and the sewer, the reservoir and the conduit therefrom to the bowl, a pump connected to and exhausting the syphon, its actuating mechanism independent of the flow of the flushing-water, and a mechanical motor for the same, with winding connection from the motor and operating connection from the valve joined and operated at will, whereby the same movement opens the valve and stores power in the motor.

No. 343,214 is a patent for a flushing device for water-closet tanks, issued to Henry C. Weeden, of Boston, Mass., for the combination, with a flushing-tank, of a vertical adjustable syphon discharge-pipe formed in two parts, having the lower part firmly secured to the tank, and the upper part telescopically attached and provided with water-tight packing adapted to be adjusted and set at any desired point, according to the size of the tank or condition of the water.

No. 343,218 is a patent for a fusible plug, issued to William H. Bailey, of Salford, County of Lancaster, England, for the combination of a safety tube with a fusible metal disk closing the end thereof, an annular cap which holds said disk in place, and a protecting-plate which fits within said cap and over said fusible disk, and is attached to the latter, but free to be expelled by the steam when the fusible metal melts.

No. 343,251 is a patent for a filtering apparatus, issued to William Neracher, of Cleveland, Ohio, in which a filter placed in a water-supply pipe, adapted to a current in either direction, in combination with a side pipe, connected to the water-supply pipe at both ends of the filter, and three-way cocks at the junction at both ends, a side pipe connected to the water-supply pipe at one end of the filter, between the junction of the pipe and the filter, and at the other to the water-supply pipe at a point outside of the junction of said pipe and the water-supply pipe, and a three-way cock at the latter junction, and devices for operating the cocks.

No. 343,326 is a patent for a house sewerage or drainage apparatus, issued to Harvey C. Lowrie, of Denver, Col., for the combination of a vertical soil-pipe communicating at its top with the open air, a main soil-pipe coupled to the foot of the vertical pipe, and an automatic flushing apparatus connected with said main pipe and with a pipe leading to a sewer, substantially as described, whereby at intervals the liquid, solid, and gaseous contents of the main and vertical pipes will be automatically withdrawn and discharged into the sewer and the soil-pipes and their laterals ventilated.

No. 343,335 is a patent for a street-receiver and stench-trap, issued to Thomas J. O'Brien, of Buffalo, N. Y., in which a street-receiver and stench-trap consisting of parts, each having a slideway, a pipe or tile receiving portion, and flanges, adapting them to be bolted together, in combination with the sliding plate or door and the bottom, having the cross-piece and flanges, adapting it to be bolted to the two side pieces.

No. 343,531 is a patent for a steam-boiler or other furnace, issued to John H. Blanchard, of Boston, and Florentine A. Jones, of Malden, Mass., Blanchard assignor to Jones, for the combination with a furnace, a hollow wall provided with perforations extending from the interior outward through the side opposing the draft, said wall being so situated and constructed as to arrest and deflect the products of combustion downward and under said wall after they have passed over the bed of fuel.

No. 343,668 is a patent for a pipe-wrench, issued to John J. Looney, of Hazel Green,

Wis., assignor to himself and William T. Andrews, same place, and Arkansas West, of Galena, Ill., for the combination of a double-faced jaw formed integrally with the handle of the wrench, its faces which engage the pipe making different angles with said handle, and a second co-operating jaw pivoted upon a revoluble support upon the handle-bar of the wrench.

No. 343,830 is a patent for a self-closing faucet, issued to Joseph C. Miller, of Chelsea, Mass., consisting of a body, a screw-cap, an interior frame, a lever pivoted to the said frame and having the connecting-link pivoted thereto, and the valve pressed to its seat by a spring and having the valve-stem passing through the cap and pivoted to the said link, and the shell-cap inclosing the pivoted connections of the actuating parts.

No. 343,853 is a patent for a flushing-tank, issued to Andrew Rosewater, of Omaha, Neb., for the combination, with a syphon, of a pipe communicating with the top thereof, the end of said pipe being provided with an enlarged portion, an inlet pipe the end of which is within the enlarged portion of the other pipe, a vertical pipe the lower end of which communicates with the interior of the syphon below the bottom of the short arm, and its upper end communicates with the tank and a trap at the bottom of the syphon.

No. 343,921 is a patent for a device for washing out locomotive-boilers, issued to William D. Robb, of Belleville, Ontario, Canada, for an improved apparatus for washing out locomotive-boilers, consisting of a tank supplied with water from the ordinary source, and connected to the sand or other heating furnace, in combination with pipes leading from the said tank, and provided with connections by which the steam from the locomotive can be blown into the water-tank and the water drawn therefrom for the purpose of washing out the locomotive-boiler.

Association News.

NEW YORK MASTER PLUMBERS.—Just previous to the Deer Park Convention the association appointed a committee, as noticed at the time, on conference with the Journeymen's Association, on the subject of "Card No. 1," and especially the matter of apprentices. This committee had one informal meeting with a committee of the journeymen, but as neither committee was empowered no result was reached. Mr. James Muir, chairman, being now in Europe, Mr. Gilroy will act as temporary chairman, and Mr. J. N. Knight has been added to the committee. We are informed that the journeymen took such a position at the previous meeting as indicates an amicable settlement of the points in dispute. At the meeting of the Master Plumbers' Association, July 9, a partial report was made by the delegation on the work of the Deer Park Convention, and President John Byrns appointed Messrs. Mitchell, Scott, J. Toumey, Macdonald, and Young a committee to present a plan of action to the association under the trade-protection policy now adopted by the National Association, of allowing the local associations to make their own agreements with manufacturers and dealers, subject to the approval of the Executive Committee of the National Association. The treasurer's quarterly report was presented and showed a comfortable balance in the association's favor. Several candidates were presented for election to membership.

The New York delegation gave to a number of Chicago delegates who came to this city after the convention quite a "set up," with an excursion down the Bay, and also up the Hudson River. The Chicago men were delighted with the hospitalities shown them.

PHILADELPHIA MASTER PLUMBERS.—The association met July 9, the president, W. W. Mentzinger, in the chair and Mr. Enoch Remick, secretary. Major William E. Forster, of Norfolk, presented the association with a handsome copy of Webster's Unabridged Dictionary, and it was received with thanks. The list of master plumbers registered at the health office was read and those vouched for by members checked off, and those unknown by the members a note was taken for future reference. The account of the treasurer of the association was then read and referred, after which the Conference Committee reported they had received an application from the Journeymen's Association asking for a conference with them, but had not yet fixed the time of meet-

ing. A communication from a young apprentice desiring a place to finish his trade was referred to the Apprentice Committee, after which the report of the delegates to Deer Park Convention of the National Association was presented by Mr. Wm. Harkness, Jr., the chairman of the delegation from the association, being a synopsis of the business done at the convention. The report was approved and filed. The Trade School Committee presented their report, in which they set forth they had closed the school for the season after a most successful and gratifying session, during which time eight young men had received diplomas as graduates of the school and that the school was in a good solid condition both financially and educationally. Mr. Wm. Lindsley spoke on the rules and regulations in vogue at the health office and moved that a special meeting be called for next Thursday for the discussion of the rules, but on motion of Mr. Worthington a committee of five, consisting of Messrs. Harkness, Worthington, Lindsley, Eyanson, and W. S. Clark, was appointed to confer with the Health Board, looking to the revision of certain of the rules. It was reported that the terra-cotta dealers were selling to certain parties pipe at less than the rates charged to plumbers, and a discussion of considerable length was had and the president was instructed to confer with the terra-cotta dealers in reference thereto, after which the association adjourned.

CHICAGO MASTER PLUMBERS.—The Chicago Master Plumbers' Association met July 7, T. C. Boyd chairman. For the Apprenticeship Committee, David Whiteford referred to the adoption by the National Convention of the Chicago method of governing apprentices, and thought that when the method was well under way it would give first-class results. Rent bills for the hall occupied by the apprentice boys' association, now numbering 52, were ordered paid and assumed indefinitely. It was unanimously voted to send all "the kids" to these apprentices' meetings, whose object is to graduate boss boys, all of whom propose to wear badges of membership and superior good conduct and workmanship. J. H. Norton, T. Robinson, and J. H. Bradley were elected members. Speeches on the late National Convention of the craft were made by a number, and on motion of J. J. Hamblin, seconded by ex-delegates D. C. Rock and M. Moylan, thanks were voted to the Washington, New York, and Baltimore plumbers for marked attentions extended; also, on motion of E. Baggot, to Congressman Frank Lawler, of Chicago, for his marked kindness, especially in securing a special audience with President Cleveland, who had kept Senators and Representatives waiting, and had also delayed his yachting trip forty minutes in order to receive the "bus load of knights of the soldering-iron." Delegate Whiteford, following, said the convention showed that plumbers were men among men, and that they had a friendly and interested feeling for one another everywhere. President Boyd, a member of the National Executive Committee, said he was pleased with the conduct of the Chicago delegates at the convention, and with the unbroken harmony that marked the proceedings. The Washington brethren had shown themselves to be hospitality embodied, and Baltimore and New York were not behind. The visit to the White House was an appreciated episode. That the speaker was put on the Executive Committee was a compliment, not so much to him as to Chicago. On the way to Baltimore the Chicagoans named a committee to invite the convention to assemble next year in Chicago, and when Delegate Corboy extended the invitation in behalf of his colleagues, every face brightened with approval, and it was so ordered unanimously.

PERSONAL.

PASSED ASSISTANT ENGINEER WILLIAM B. BOGGS, U. S. N., died at Guayaquilla, Peru, on June 21. He entered the Navy in 1881.

MR. JOHN H. HILL, Superintendent of the Consolidated Gas Company's Works at West Forty-Second Street, was accidentally fatally shot July 9.

Notes.

For works for which proposals are requested, see also the "Proposal Column," pages 149 and 150

CONSTRUCTION.

CHICAGO.—Contractors might address C. E. Judson, receiver of the Consumers' Gas, Fuel,

and Light Company in reference to prospective tunnel for the company's pipes; estimated cost, \$10,000 to \$12,000.

WASHINGTON, D. C.—A town is to be built on the Washington and Ohio Railroad, about seven miles from Washington. The scheme is backed by Hon. George B. Loring and other capitalists. The town will be called Loring.

JERSEY CITY, N. J.—The Reservoir Park will be improved if recent action of the Board of Finance is confirmed. It is proposed to spend \$25,000 in improvements on Manhattan Avenue in connection with the scheme.

KANSAS CITY, MO.—The Kansas City Board of Trade has adopted plans, etc., submitted by Messrs. Burnham & Root, of Chicago, and those gentlemen have been appointed by the board to supervise the construction of the building, which will be commenced immediately; cost, \$400,000.

BRAMPTON, ONT.—An important work, the diversion of the Etobicoke River, and the arrangement of a system of sewerage, have been reported upon by Mr. Alan Macdougall, M. Inst. C. E., Toronto.

BRIDGEPORT, CONN.—The *Standard* says that a movement is going on to induce the city to buy the works and franchises of the old and the new water companies.

TOLEDO, O.—Proposals are advertised for the paving of streets and for the boring of several artesian wells until July 20, 1886. Address H. D. Standart, City Clerk, or the City Engineer, Toledo, O.

JACKSON, MICH.—Mr. J. D. Cook, civil engineer, of Toledo, O., has prepared plans for a system of sewerage at Jackson, Mich., for water-works at Emporia, Kan., and for a large extension of the water-works at Omaha, Neb.

EL PASO, TEX., has asked Chief Engineer Lowrie, of Denver, Col., to submit plans for sewerage.

WABASH, IND., wants water-works, and proposals for the construction and operation will be received until July 26 by the Common Council. For information address Howe McGuire, City Clerk.

IRON-WORK FOR THE AQUEDUCT.—In our Proposal Column will be found a proposal for certain iron-work for the new aqueduct. Address the Aqueduct Commissioners, Stewart Building, until July 20.

CHATTANOOGA, TENN.—The Chattanooga Water Company has made two propositions to the City Council with reference to furnishing water from a reservoir to be built on Lookout Mountain. The company proposes to furnish water to the city for city purposes, fire, sewer-flushing, public buildings, and schools, at \$9,000 per annum; the city to have the right to put on as many hydrants as are necessary. A second proposition is that the company will furnish water to the city at \$50 per plug per annum, and \$2,500 additional for flushing sewers and for public buildings. The council has not yet taken definite action.

BRIDGEWATER, MASS.—Address E. A. Sawyer, M. D., about putting in water-works here.

TURNER'S FALLS, MASS., will have water-works. Estimated cost, \$100,000.

NEW YORK CITY.—Bids will be readvertised for completing the Metropolitan Museum of Art. The appropriation is \$300,000.

The Park Commissioners want \$35,000 for completing Riverside Avenue.

TRENTON, ONT.—The city will obtain a supply of water. A committee, on which is Mayor G. W. Osborn, has been appointed to visit various cities and inspect works. Moffett, Hodgkins & Clarke, of Watertown, N. Y., have submitted a proposition to the committee.

HASTINGS-ON-THE-HUDSON, N. Y.—The authorities are trying to secure a supply of water from the Yonkers Water Company.

LAKE, ILL., is suffering from a severe water famine.

SWAMPSCOTT, MASS.—The town is trying to arrange with Lynn for a renewal of the contract, which expired last week, by which Lynn furnishes its water-supply.

GLoucester, Mass.—The Common Council on July 6 passed an order to advertise for proposals for building a \$20,000 city hospital.

STRATFORD, ONT.—The system of sewerage for this city, prepared last fall by Mr. Alan Macdougall, sanitary engineer, Toronto, has been submitted to the Provincial Board of Health and approved by them.

CIRCLEVILLE, O.—Under proposals for the construction of water-works on the stand-pipe or direct-pressure system, the following bids were received. The city was to give a franchise for twenty years to the lowest bidder; the source of supply to be Hargus Creek two miles distant, and ten miles of mains from 4-inch to 16-inch in diameter to be laid, and 100 hydrants to be set. The bids were: Moffett, Hodgkins & Clark, Watertown, N. Y. (stand-pipe) Hargus Creek, \$4,200 annually; Darby Creek, \$4,700 annually. H. N. P. Dole, Columbus, O., (direct pressure) Hargus Creek, \$4,200 annually; (stand-pipe) Hargus Creek, \$5,000 annually. Holly Manufacturing Company, Lockport, N. Y., (direct pressure) Hargus Creek, \$5,250 annually; Darby Creek, \$6,000 annually. J. P. Martin & Co., Xenia, O., (stand-pipe), 200 hydrants, \$80; 100 hydrants, \$47.50. American Water-Works and Guarantee Co., (stand-pipe) Hargus Creek, \$3,600 annually; Darby Creek, \$4,400 annually. Samuel R. Bullock & Co., New York, Hargus or Darby Creek, \$3,500, or 12 miles of mains 130 hydrants for \$4,030 annually.

CHICAGO, ILL.—Bids were opened July 6, for supplying the city with cast-iron water-pipe of the dimensions in diameter of 6, 8, 12, 16, and 24 inches and of standard length. The following proposals were received: Ohio Pipe Company, \$31 for 6-inch and \$30 for 12-inch; Dennis Long & Co., \$33.50 for 6-inch and \$31 for 24-inch; Cincinnati and Newport Iron Company, \$32 for 6-inch and \$31.50 for 24-inch; Shickle, Harrison, Howard & Co., \$31.50 for 6-inch, \$30.50 for 8-inch, \$29.50 for 12, 16, and 24-inch; and McNeal Pipe and Foundry Company, \$34.34 for 6-inch, \$33.50 for 8-inch, \$33.12 for 12-inch, and \$32.68 for 18-inch. The contract, which calls for 2,600 pieces, was not awarded at the time of going to press.

FORT WAYNE, IND.—The work of building the Little River Ditch, which will be altogether forty-five miles long, an enterprise for the purpose of reclaiming swamp lands, will soon begin. The contract for its construction has just been awarded to Joseph Derheimer and F. C. Boltz, of Fort Wayne, for \$137,017.74. It is stipulated that the work must be completed by June 1, 1888. The ditch will extend from Fort Wayne to Huntington, Ind., with branches running in different directions.

HARTFORD, CONN.—The Commission on the State Prison has awarded the contract for building the new wing to John C. Mead. The cost will be from \$170,000 to \$190,000.

NEW YORK CITY.—Vaux & Radford, architects, of this city, have sent to Controller Loew a bid for the construction of the Harlem River Bridge. They suggest a viaduct, which they say they can construct for \$1,582,000.

The contract for building the public school building at Tenth Avenue and Fiftieth Street has been awarded by the Board of Education to Thomas Cockerell & Son at \$113,900.

ASHEVILLE, N. C.—The Water-Works Company has contracted for about \$25,000 of iron-pipe with the Chattanooga Foundry and Pipe Company. The stand-pipe, of steel, will be built by Alfred Webb & Co., also of Chattanooga; cost, \$10,000.

ALBANY, N. Y.—Contracts have just been let for alterations and additions to the Executive Mansion, on Eagle Steet. Mr. Perry, Superintendent of the Capitol, is the architect, and Patrick McCann, the contractor; cost, \$36,977. The alterations are extensive, very little of the present building remaining.

GRANT MONUMENT.—The Grant Monument Association has received from Joseph Echeler, of Bavaria, a model for the memorial to be erected to General U. S. Grant in the Riverside Park in this city.

THE President has vetoed the bill providing for the erection of a public building at Dayton, O.

SEWER-PIPE MANUFACTURERS.—The convention of sewer-pipe manufacturers was held in Cleveland last week, closing July 9. A constitution was adopted and the following board of trustees chosen: I. L. Otis, of Rochester, N. Y.; Theodore Rhodes, of Columbus, O.; Hugh McMahon, of Cumberland, W. Va.; David E. Hill, of Akron, O.; George P. Sperry, of Tallmadge, O.; Frank Boles, of Toronto, O.; and N. U. Walker, of Wellsville, O.

LAFAYETTE MONUMENT.—The Boston Herald's Washington correspondent says that the committee on designs for the monument to Lafayette, for which Congress has appropriated \$50,000, has now received designs from David C. French, Larkin G. Meade and the French sculptors, Bartholdi and Falguierre, and is awaiting one from Mercie, also of France, before taking any action. The committee is the Secretary of War, architect of the Capitol, and the chairman of the joint committee on the library.

GOVERNMENT WORK.

SYNOPSIS of bids for plaster models for the following-named buildings, opened July 6, 1886:

BIDDERS.		
J. Juvenal.....	\$456	C. H. & P. O., Aberdeen, Mass.
H. D. A. Henning.....	210	
C. W. Buchler.....	220	C. H. & P. O., Baltimore, Md.
Fernand Moreau.....	155	
More & Pauch.....	347	C. H. & P. O., Galveston, Texas.
	401	
	1,593.00	P. O., Minneapolis, Minn.
	486.00	
	\$283.00	C. H. & P. O., Nebraska City, Neb.
	\$199.00	
	130.00	C. H. & P. O., Pensacola, Fla.
	241	
	\$2.832	C. H. & P. O., Pittsburg, Pa.
	1,700	
	2,158	C. H. & P. O., Quincy, Ill.
	3,023	
	1,143	P. O., Etc., St. Joseph, Mo.
	1,299.00	
	225.00	C. H. & P. O., Syracuse, N. Y.
	78.00	
	115.00	
	622.50	
	126.50	
	225.00	

BOSTON, MASS.—The monthly report of City Engineer Jackson to the Water Board in regard to the consumption of water in Boston, in June, shows that the average daily consumption was 26,574,900 gallons from the Sudbury River and Lake Cochituate Water-Works, a decrease of 2.3 per cent. from the amount used in June, 1885. The consumption from the Mystic Water-Works was 6,981,100 gallons daily, an increase of 5.3 per cent. The average amount pumped at the pumping-station at Roxbury was 2,874,200 gallons per day, a decrease of 3 per cent. from June, 1885. The use of the Mystic water has been much increased during the past few days; during the past six days the average daily consumption was 7,750,000 gallons, the amount used in one day being 8,350,000 gallons. There is no immediate danger of a scarcity of water, though a drought is not usual before August. Basin No. 3 is at present empty, in order that the shallow flowage may be remedied. Basin No. 4 is full, and has not yet been drawn upon. The water used at present is taken from basin No. 2, which is being lowered at

the rate of four inches a day. The water is two feet below the crest of the dam, but eight feet above low-water mark.

THE P. C. & St. L. R.R.Co. is about to build about thirty miles of road from Red Bank, on the Little Miami Division, seven miles east of Cincinnati, to Hamilton, on the C. H. & D. Railway, twenty-five miles north of Cincinnati. The contracts have not been let. Address, "Ralph Peters, Supt. Little Miami Division, Cincinnati, Ohio."

BOOKS AND PAMPHLETS RECEIVED.

ANNUAL REPORT OF C. N. DANENHOWER, CHIEF ENGINEER, to the Board of Public Works of Cincinnati, O., for the year ending December 31, 1885. Cincinnati: Wiltstock, Baldwin & Co. With maps and plates.

ST. MARYLEBONE INFIRMARY, Notting Hill, London, Sick Poor Hospital. By H. Saxon Snell, F.R.I.B.A. London: B. T. Batsford. Illustrated. pp. 15.

REPORT OF THE MEDICAL OFFICER OF HEALTH OF NEWCASTLE-UPON-TYNE, for 1885. Andrew Reid, printer. pp. 138.

FIRST ANNUAL REPORT OF THE STATE BOARD OF HEALTH OF MAINE, for the year ending December 31, 1885. Augusta: Sprague & Son. With plates. pp. 331.

TRANSACTIONS OF THE NEW ENGLAND WATER-WORKS ASSOCIATION during the year 1885. Newton, Mass.: Journal Press. Maps and plates. pp. 240.

ESTHETICS OF MEDICINE. By H. A. Cottell, M. D. Reprint from *American Practitioner*. pp. 26.

TENTH ANNUAL REPORT OF THE WATER COMMISSIONERS OF THE CITY OF TAUNTON, MASS. November 30, 1885. Taunton: C. A. Hock & Son. With plates.

[TOO LATE FOR CLASSIFICATION.]

PROPOSALS.

PLUMBING MATERIALS AT JEFFERSON CITY, MO., AND COLUMBUS, O.—Treasury Department, Office of the Supervising Architect, Washington, D. C., July 12, 1886. Sealed proposals will be received at this office until 2 p. m. on the 31st day of July, 1886, for supplying and delivering at the public buildings at the places above named, all the plumbing and gas-piping materials required, in accordance with the schedule and specification, copies of which and any additional information may be had on application at this office or the office of the local superintendents. Bids must be accompanied by a certified check for \$200 for each building. M. E. BELL, *Supervising Architect*.

LABOR AND MATERIALS AT GALVESTON, TEXAS.—Treasury Department, Office of the Supervising Architect, Washington, D. C., July 9, 1886. Sealed proposals will be received at this office until 2 p. m. on the 4th day of August, 1886, for all labor and materials for the masonry, carpenter and joiner's work, plastering, painting and glazing, mantels and floor tiling, required to complete the Custom House, etc., building at Galveston, Texas. Copies of the drawings and specification and any additional information may be had on application at this office or the office of the superintendent after July 20. Bids must be accompanied by a certified check for \$2,000. M. E. BELL, *Supervising Architect*.

BUILDING INTELLIGENCE.

(Continued from page 150.)

LATE NEW YORK BUILDINGS.

N w cor 8th av and 130th st, 9 br flats and stores; cost, 1, \$25,000; 8, \$16,000 each; o, H. J. Beaudet; a, R. R. Davis.

S e cor 132d st and 8th av, 4 br flats; cost, 1, \$25,000; 3, \$16,000 each; o and a, same as last.

115th st, n e cor Lexington av, br flat; cost, \$35,000; o, Louis Rossi; a, A. B. Ogden & Son.

MISCELLANEOUS.

ATHENS, GEO.—Address J. H. Rucker about a large elevator and grist-mill here.

BALTIMORE, MD.—Eutaw, near Lexington, 2 4-story br stores and dwells; o, Dr. Thomas Sappington.

McHenry, near Scott, 4-story br warehouse; o, Bartlett, Hayward & Co.

Aisquith, near Fayette, 3-story br college; o, Md. Col. of Pharmacy; a, J. A. & W. T. Wilson.

71 Lexington, 3-story br store; o, Martha Cowman; a, C. E. Cassell.

Charles, near Eager, 3-story br club house; o, Baltimore Club; a, J. A. & W. T. Wilson.

Franklin, near Pine, 2 3-story marble dwells; o and b, Jos. M. Cone.

Division and Townsend, 3-story br bldg; o, St. Vincent's Infant Asylum.

277 W. Baltimore, 5-story br warehouse; o, A. S. Abell.

Roberts, near Linden, 6 3-story br dwells; o, J. W. Haffacker.

Baltimore and 2d, 6-story br offices; o, John S. Gittings.

BINGHAMTON, N. Y.—Address Much Bros., of Waverly, N. Y., about a \$75,000 opera house here.

BIRMINGHAM, ALA.—The Caldwell Hotel Company will build a hotel here. Henry Allen is contractor.

Richard Church will build a tool factory here.

BOSTON, MASS.—13 Isabella st, br dwell; cost, \$18,000; o and b, J. H. Adams.

1440-1442 Dorchester av, br dwells; cost, \$20,000; o and b, Henry Field.

43-45 Bedford st, br mercantile bldg; cost, \$65,000; b, Isaac T. Barr.

CHICAGO, ILL.—366 N. Market, br flats; cost, \$10,000; o, H. S. Jaeschke; a, H. M. Hansen.

3831-41 Forest av, br dwell, cost, \$16,000; o, N. Lancaster.

34-36 W. Madison, br store and dwell; cost, \$16,000; o, F. E. Spooner.

Commercial and Clybourn Place, car-barn, etc.; o, Chi. W. Div. R'y Co.

Laughton and Leavitt, car-barn, etc.; o, same as last.

817-39 Walnut, dwells; cost, \$35,000; o, H. Davis.

743-51 Warren av, br dwells; cost, \$25,000; o, F. L. Campbell; a, C. A. Weary.

931-41 Sawyer av, br dwells; cost, \$15,000; o, F. B. Abbott.

3642 Grand Boul, br dwell; cost, \$12,000; o, C. H. Nichols.

668 Throop, br store and flat; cost, \$10,000; o, Jos. Donnelly.

74-78 Coulter, br dwell; cost, \$10,000; o, F. L. Campbell.

Prairie av, opposite 30th, church to seat 700; cost, \$75,000; o, St. Paul's Universalist; b, not let.

371-75 Idaho, br flats; cost, \$15,000; o, Geo. H. Hull; a, S. B. Dill.

Lincoln and 14th, round house; cost, \$22,000; o, Chi. and Great Western R'y Co.; b, H. E. Courtney.

Polk and Oakley, br flats; cost, \$10,000; o, G. W. Williams; b, Warneke & Hogge.

491 S. Green, br brewery; cost, \$35,000; o, Brewer & Hoffman Brewing Co.

237 E. Division, br store and dwell; cost, \$11,000; o, C. Mandeville; a, E. J. Ostling.

930-32 W. Van Buren, br livery stable; cost, \$10,000; o, Decker & Knox.

428-50 Fifth av, br passenger depot; cost, \$10,000; o, Chi. and Great Western R'y Co.

47 and 63-67 Cypress, br dwells; cost, \$11,000; o, F. B. Clark.

296-300 S. Canal, br warehouse; cost, \$12,000; o, Swift & Co.

43-45 W. Indiana, 4-story store and flats; cost, \$10,000; o, A. W. Petterson.

2310-18 State, carriage repository and flats; cost, \$20,000; o, E. J. Lehman; a, Treat & Foltz.

302-04 Idaho, br dwell; cost, \$10,000; o, O. Carson.

1030 Milwaukee av, br store and flats; cost, \$10,000; o, A. Uihlein.

(Continued on page 161.)

THE SANITARY ENGINEER.

DEVOTED TO

ENGINEERING, ARCHITECTURE, CONSTRUCTION, SANITATION.

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THE COMPETITION FOR THE KANSAS CITY EXCHANGE BUILDING.

THE competition for the Kansas City Exchange Building, which, from the careful and exemplary manner in which it has been conducted, is perhaps the most noteworthy ever held in this country, is concluded, although the official report has not yet been made, and the result, so far as we can tell without ourselves having examined the drawings, seems to have been in every way satisfactory, and should encourage large corporations, and others about to erect expensive buildings, to follow the example set them in Kansas City. Two points deserve especial notice. It is in a city of the far West that a committee has been found with the clear-sighted and open-minded intelligence which led them to place the conduct of their competition from the outset unreservedly in the hands of a competent professional adviser, and their action contrasts, in a manner to make Bostonians blush, with the conduct of the commission having charge of the late competition for the New Court House for Suffolk County, Mass. The other point to which we would call attention is, that this competition, conducted by an Eastern architect, has resulted in the choice of a Western firm—Messrs. Burnham & Root, of Chicago—to carry out the work. The people of the East are, perhaps, too ready to undervalue the taste and cultivation of the West; and indications like the present, that the West is advancing in these matters also, should gratify them, while at the same time it should cause them to look well to their laurels. Two other Chicago firms are among the five considered best—Messrs. Edbrooke & Burnham and W. W. Clay—the remaining two being Watson & Tuckerman, of New York, and J. L. Faxon, of Boston. Only one, therefore, of the firms invited to compete are among the five, and that firm the successful competitors.

THE NEW CROTON AQUEDUCT INVESTIGATION.

THE Commissioners of the new Croton Aqueduct of this city have done themselves, their Chief Engineer, and the public a great service in having a thorough and public investigation and report made by a board of competent and disinterested engineers of the charges preferred against the Chief Engineer by the Engineer of Construction, one of his subordinates.

The charges made were, it is true, presented by a person who had been removed for insubordination, and, to use the mildest term, incompatibility, and for that reason were open to the suspicion of having been inspired more by a desire to "get even" with somebody than by a disinterested abhorrence of wrong-doing, but no one would have believed them to be so frivolous as they have been proved to be, without the careful examination and analysis of them which the distinguished gentlemen appointed to examine into them have made, and the result of which is given in another column.

It is not often that the engineer-in-chief of any large work is afforded the opportunity of having his official acts criticised closely, his orders and the opinions on which they were based examined minutely, and his conduct of work endorsed emphatically by such men as Generals Greene, Newton, and Gillmore, each eminent in civil engineering, in the administration of public affairs, and distinguished in the highest branches of military operations.

The failure of the charges appears the more complete from the fact that the maker is an officer in the Government service. To this may be attributed the leniency with which he is treated by the board, for a comparison of the charges made with the facts found would have warranted them in using the severest terms of condemnation toward the spirit which framed them.

In the course of their investigation, the members of the board personally examined every shaft and heading, the work already done and that in progress, the records in the Chief Engineer's office, and took the testimony of all the employees who were summoned on either side, and their report is a complete and careful summary of their matured conclusions. As expressing the opinion of experts on many points of theory and practice in the management of great public works, it is well worth perusal.

While the form of expression of this opinion varies somewhat in each of the ten or a dozen cases decided, the general purport is the same as the concluding sentence of the case, that the Chief Engineer's "decision was just toward all parties, conformable to custom, and entirely correct."

DUST.

THE personal discomforts and, in some cases, danger which are caused by living in an atmosphere laden with dust are more or less familiar to all our readers. In some occupations it is a serious cause of disease, and special precautions to protect the workmen from its effects have been of late years more and more insisted on, and are now to be found in use in the best regulated factories.

This is especially the case with regard to those dusts composed of minute angular particles of stone or metal, such as are produced in the operations of grinding and polishing, and which tend to produce fatal disease of the throat and lungs. Another specially dangerous class of dusts are those which act not so much mechanically as by their chemical properties—the poisonous dusts as they may be called. Such dusts are found in color-grinding establishments, in white-lead works, in workshops for the manufacture of artificial flowers, etc., etc., the dangerous element being in most cases lead or arsenic.

With regard to arsenical paper-hangings, whatever may be thought as to the probability of the production of disease by the slow and continued evolution of arseniureted hydrogen—and it seems to us that more experiment and observation is needed in this direction—there can be

no doubt as to the dangers of the dust derived from the surface of such papers.

Then we have the ordinary street dust, largely composed of finely pulverized horse-dung, which not only annoys us when walking or driving, but which permeates our houses, and there, reinforced by fresh clouds raised by the housemaid's broom, covers furniture, books, and pictures with its gray shroud.

There is, nevertheless, something to be said in favor of this general plague of dust: we should be badly off in some respects without it. All ordinary air contains dust, and the particles of dust in the air form centres of condensation for the watery vapor in the air, thus giving rise to fogs, clouds, and rain.

If there were no dust in the air, whenever the air became supersaturated with moisture the latter would condense and deposit on all solid bodies with which it came in contact. The under side of our umbrellas would be as wet as their tops, both

OUR BRITISH CORRESPONDENCE.

Dr. Farquharson's Bill for the Registration of Buildings—Holloway College for Women—Report of the Committee on the Ventilation of the House of Commons.

LONDON, July 3, 1886.

AMONGST the bills that had to be dropped, owing to the sudden dissolution of Parliament, was one by Dr. Robert Farquharson, under the title of "The Sanitary Registration of Buildings Act." It is to be hoped that this will be resuscitated with the new Parliament. It provides that any local authority, having in its jurisdiction a district of not less than 50,000 inhabitants, may adopt the bill, appointing some person as Sanitary Registrar, whose duty it shall be to issue notices and certificates, and keep record of same. The owner, or, failing him, the occupier of every building in any district where the act is in operation, shall, previous to January 1, 1889, file a certificate with the said local authorities, declaring that the building is in a satisfactory sanitary condition. This certificate must be signed by one or other of the following bodies: A member of the

certificate, with a further cumulative penalty of one pound for every day after conviction. The offence of a person giving a false certificate hardly seems fully recognized in the penalty provided, even if the penalty on the owner is sufficient, which is questionable.

The Queen has opened the Royal Holloway College for Women. This building is the result of a donation by the late Mr. Thomas Holloway, the well-known manufacturer of pills. This gentleman devoted a million pounds to the purpose of building (1) a sanitarium destined for the receipt of curable cases of lunacy, and (2) a college for the better education of women of the middle and upper middle classes. Neither of these buildings is to partake of the nature of a charitable institution, but they are both to be paying concerns. The building contract of the Holloway College was £300,000 (\$1,440,000), the builder being J. Thompson, of Peterborough, and the architect W. H. Crossland. The external dimensions of the college are 525 by 360 feet, the plan being a double quadrangle. The design, which is in the style of the French Renaissance



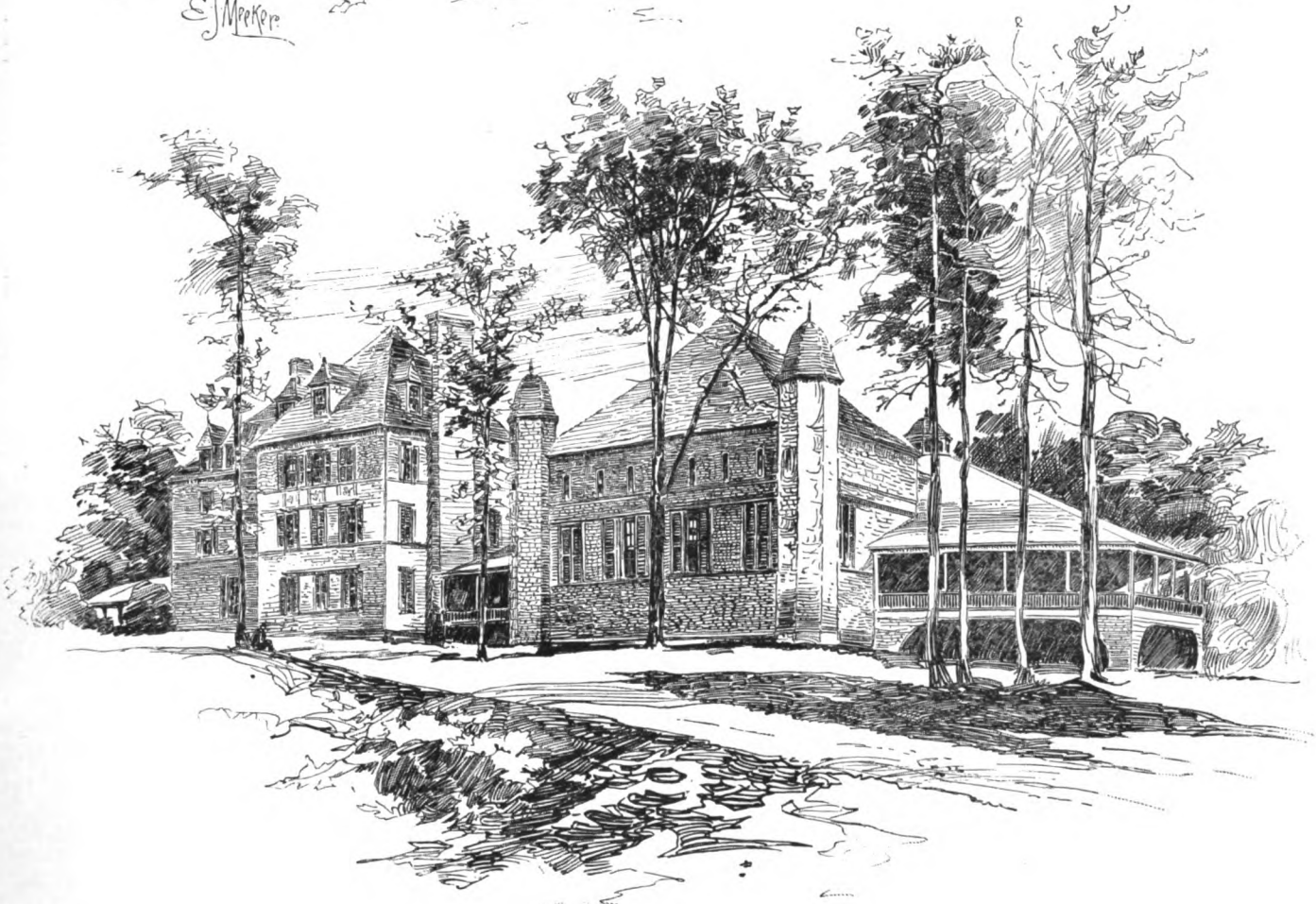
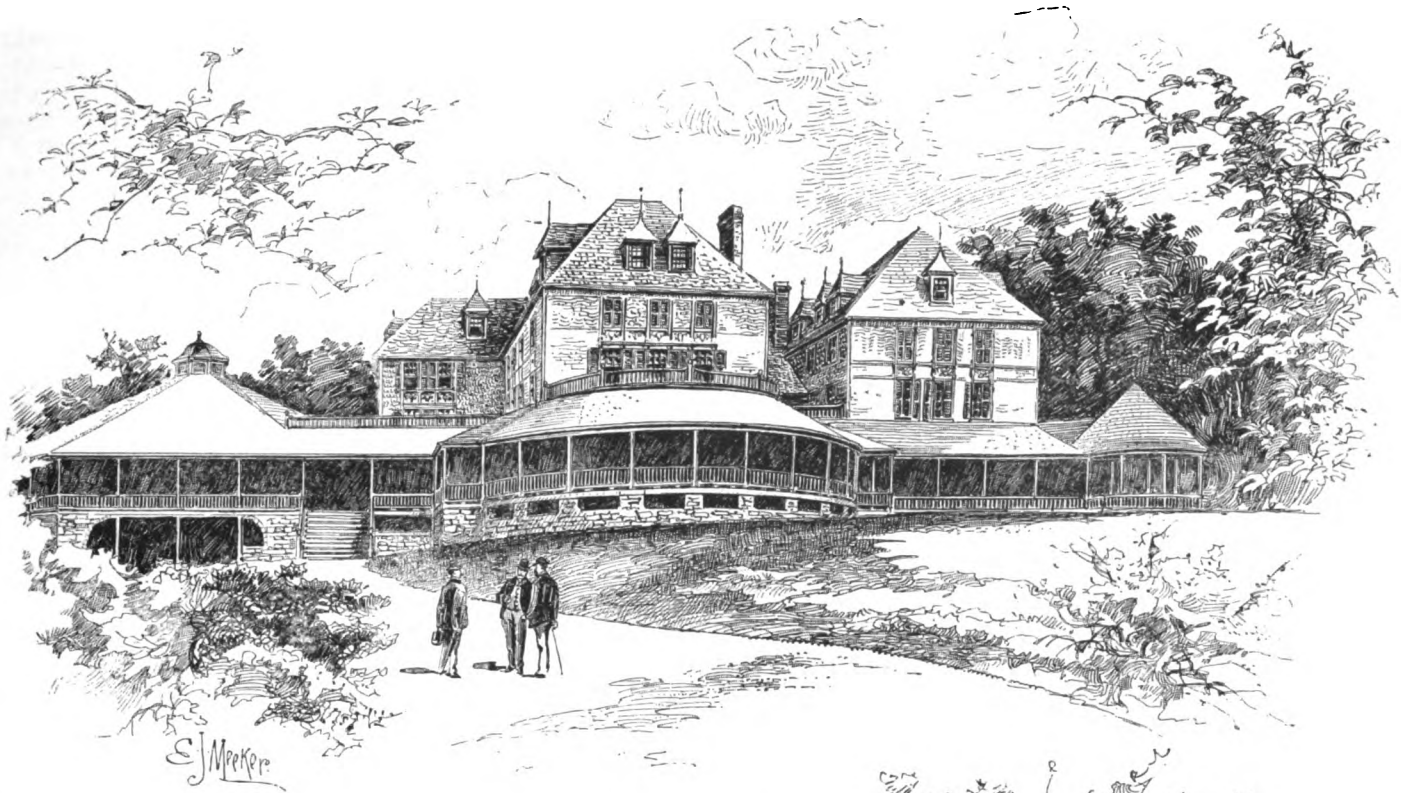
A COTTAGE AT TUXEDO PARK, N. Y.—BRUCE PRICE, ARCHITECT.

the inside and outside of our houses would drip with moisture, and we should fulfill Mr. Mantalini's threat, and become "dem'd damp unpleasant bodies." This may not be much consolation when one is half blinded and strangled by the whirling cloud of dust with which the wind sometimes envelops us, but it will do to tell the other man when he comes in from the street and complains about such an experience.

At the annual meeting of the Sanitary Protection Society, of Newport, R. I., July 14, the following officers were elected: President, Hon. Francis Brinley; Vice-President, William C. Rives; Treasurer, A. B. Almon; Recording Secretary, Dr. William Thornton Parker; Corresponding Secretary, Dr. Horatio R. Storer. Councillors: Lucius D. Davis, Dr. Francis H. Rankin, George C. Mason, Francis O. French, Dr. Ezra Dyer, Dr. W. J. Rives. Consulting Engineers: Colonel George E. Waring, Jr., Captain J. P. Cotton, George N. Bell. Chemical Analyst: Professor William B. Hills, M. D., of Harvard University. Inspecting Engineer: William H. Winslow, of Boston, Mass.

Institute of Architects or Civil Engineers who has been in practice five years before the passing of the act; a member of incorporated sanitary associations; medical officers of health and medical practitioners qualified in sanitary science, also by surveyors and engineers to local authorities. The qualification of the medical practitioners will, I think, be a *casus belli*, as it is an indefinite quantity in the proposed act. Every medical officer should, of course, to a certain extent, be qualified in sanitary science. As a matter of fact, he is not, and, in a great many cases, does not trouble himself at all about it. On payment of fee to the local authorities with a written request, the building may be certified, if fit, by the local borough surveyor or engineer. A clause provides that, after the date named, it shall not be lawful for any building to be occupied unless the said certificate has been deposited. The two concluding clauses are open to discussion. The ninth declares that any person—that is to say, any certified sanitary expert—giving a false or misleading certificate, shall be liable to a fine, not exceeding £10 (\$48). The tenth provides a similar fine on the owner of any building occupied without

type of the Chateau de Chambord, was decided on by Mr. Holloway, after traveling through Europe in company with the architect and his brother-in-law, Mr. Martin Holloway, who has carried out the design of the founder since his death. There is an elaborately fitted-up kitchen, with steam-heating apparatus; the main halls and passages throughout the building are heated by steam-coils, coal fires, however, being used in the students' apartments and general living-rooms. The steam-plant is situated 200 yards distant from the main building, and consists of three Lancashire boilers with a pressure of 75 pounds; dimensions 30 feet by 7 feet 6 inches; flues, 3 feet in diameter, and 6-foot grate; $\frac{1}{4}$ -inch shells and $\frac{1}{8}$ -inch ends, of Sledshill and mild steel. A 6-inch main steam-pipe communicates with a receiver in the centre of the main building, whence all branches are taken, with reducing-valves. There are two other boilers in the engine-house for power purposes. The steam-heating works have been carried out by R. B. Stirratt, of Palace Chambers, Westminster, and have several novel features, of which I propose giving a detailed account later on.



THE SANITARY ENGINEER ILLUSTRATED SERIES.

THE CLUB HOUSE AT TUXEDO PARK, N. Y.

BRUCE PRICE, ARCHITECT.

A reference was made in the columns of THE SANITARY ENGINEER, in the issue of the 17th ult., to the proceedings initiated by Mr. Booker, the Sanitary Inspector of Coventry, against a certain Mr. Beech, with regard to the substitution of proper accommodation on the premises of the said Beech in the place of the old privies. Although the Local Government Board confirmed the decision of the local authorities in condemning the said Beech in these costs on his appeal, he has not, up to the present, paid the money, but has necessitated action in the Coventry City Police Court for recovery of the amount. His present contention is that the closets should be kept in a fit and proper state by the local authorities. It was deposed that the work had been performed and completed in a proper manner, and judgment was given against the defendant with costs. The most interesting point of the case, however, seems to be that this said person Beech is actually a Town Councillor. The case offers another strong argument on behalf of the sanitary inspectors, that they should be, to a large extent, independent of such local authorities.

The second and final report of the Select Committee appointed to inquire into the ventilation of the House of Commons has now been published. The predominant feeling after reading this report is, firstly, one of surprise that Mr. Barry, the architect, should have presided over the inauguration of such a system of drainage as is disclosed; and secondly, that the successive Parliaments have endured it for such a length of time without a serious epidemic of sickness. The committee, composed of Dr. Farquharson, Sir Henry Roscoe, Mr. Lyell, Sir Guyer Hunter, Mr. Isaacs, Mr. Richard Power, Mr. Tatton Egerton, and Mr. Cyril Flower, state that they have confined their attention chiefly to the question of the drainage of the Palace of Westminster, of which the Houses of Parliament form the major part, in the belief that the first step toward obtaining a supply of pure air is to see that the drainage system is effective. In a preceding report they stated their conclusion that sewer-gas finds its way into the drainage system of the Palace from the unventilated low-level sewer of the Metropolitan system. This was especially noticeable at high water, and they recommended, as a temporary step, the ventilation of the large sewer traversing the Palace by two intake pipes near the centre, and two up-cast shafts at the Victoria and Clock Towers, respectively. These recommendations were adopted and carried out with satisfactory results, but the committee insist on the temporary nature of the measures. Adopting the words of Sir Robert Rawlinson, they hold that "to free the basement from even a suspicion of taint from the Metropolitan sewer," and to prevent the possibility of any passage of gas from the low-level sewer to that of the Palace system, it is absolutely necessary to cut off the latter from the Metropolitan system. The existing main sewer under the Palace is brick, 3' 1" wide, varying between 4' 6" and 10' 6" in height, with flat curved invert, upright sides and semi-circular crown, with a fall of 1 in 212, and receiving about 84,000 gallons daily. At its lower end—i. e., that adjoining the Metropolitan low-level sewer—its invert for some 150 feet is 12 inches below the lowest level at which the sewage flows into the Metropolitan sewer; it therefore always contains a mean depth of 12 inches of sewage matter, which increases in proportion to the larger body of sewage in the low-level sewer outside. In addition, the Palace sewer, on this length of 150 feet, has two large self-acting flaps and penstocks, destined to prevent back-water from the Metropolitan sewer when in flood. Of course, at such times it becomes temporarily an elongated cesspool, and the sewage from the Palace buildings is penned, until such time as the head of water outside falls away. Gas is, of course, generated by this stagnant sewer, assisted by waste steam from the warming apparatus to the Houses and high-pressure steam and hot water from the boilers, which are discharged directly into the Palace sewer. The report states that many of the closets, urinals, lavatories, etc., are still unventilated, "and in direct communication with the sewers," apparently, therefore, without traps; the connections, therefore, form a direct channel for introducing sewage-gas into the corridors and offices of the House. Even assuming the presence of traps, which is not stated, it is probable that the pressure afforded is sufficient to force an unventilated trap. The Metropolitan sewer is 7 feet 9 inches in diameter, with a fall of 1 in 2,640, and with a depth of sewage of 3 feet 6 inches to 4 feet 6 inches. Deposit is constantly occurring, and there is a periodical employment of men to remove same. As there are no other means of

ventilating the sewer afforded in the vicinity of the House of Parliament, and the Board of Works have intimated their intention of not adopting any such, the sewage-gas generated in the low-level sewer penetrates into adjacent sewers, among others that traversing the Palace of Westminster, which is ventilated partly by the up-cast shafts referred to above and partly through the connections of closets, lavatories, etc. In addition to the main sewer of the Palace system referred to, there is a smaller one, running north and south under the basements of the Houses and connected with the main in the vicinity of the Clock Tower. At the point of junction there is a heavy iron flap across the mouth of this auxiliary sewer, which, as there is very little fall to the sewer, simply serves the end of ponding back the sewage. This section of the sewer is continually accumulating sewage deposit, owing to the presence of catch-pits in its course, necessitating periodical removal by men. The position of the kitchens and the practice of depositing garbage and kitchen refuse in dust-bins in the interior of the building are also contributory to the impurity of the atmosphere. One of these dust-bins is directly at the foot of the staircase leading to the ladies' gallery, and the stench from this filth-receptacle, having no other outlet, pass up the staircase, and so through the building. To remedy the existing state of things the committee recommend the adoption of Shone's hydro-pneumatic system, the sewage being led by gravitating sewers into the ejectors, and expelled thence by compressed air into the low-level sewer. They recommend that three ejectors be laid down, two to be worked alternately, the third being auxiliary for storm-water. The compressed-air power for working the ejectors is to be produced by three 4-horse power gas-engines, with three cylinders for containing the compressed air; one engine and cylinder for ordinary use, and the other two as auxiliary, for wet weather, etc. They further recommend the construction of an egg-shaped sewer, 3 feet 8 inches by 2 feet 4 inches, of white glazed fire-bricks, laid in Portland cement, with a fall of 1 in 212, and a run of 985 feet, be constructed along the inside of the existing sewer, the space between the new and the old sewers to be filled in with concrete or lime core. An automatic flush-tank, with a content of 1,000 gallons, is to be placed at the head of this sewer. The question of ventilating the sewer and water-closets, abolition of garbage-bins, etc., are dealt with, and a total vote for the sum of £13,265 (\$63,672) recommended. It is illustrative of the practice here, that no plans of any kind showing drainage, etc., were forthcoming for the use of the committee. The architect had

never handed over any such plans to the Metropolitan Board of Works on the completion of the buildings, and although repairs, under the direction of the board, have been going on continually, it has never apparently been considered necessary by the board to remedy this omission. A recommendation was made by the committee which will commend itself to all. At the present time, it appears, the various departments of drainage, heating, and lighting, cleaning, and kitchen and cooking arrangements, are all under separate authority; it is urged that they shall be centralized, and that one single authority shall be responsible for the sanitation of the House. A further strong recommendation was added to the report to the effect that as sanitary engineering is now distinctly a speciality, the remedial works should be designed and carried out under the superintendence of an expert of the highest professional standing. SAFETY-VALVE.

OUR SPECIAL ILLUSTRATION.

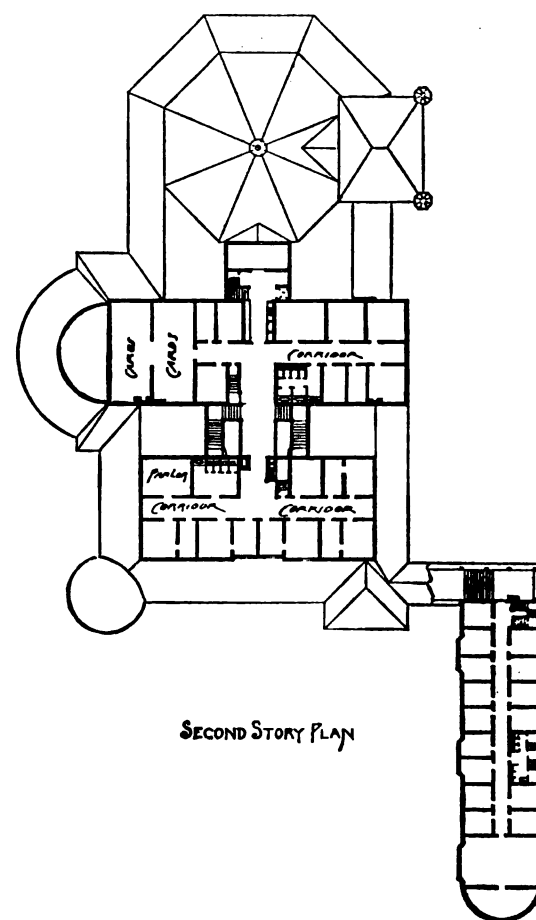
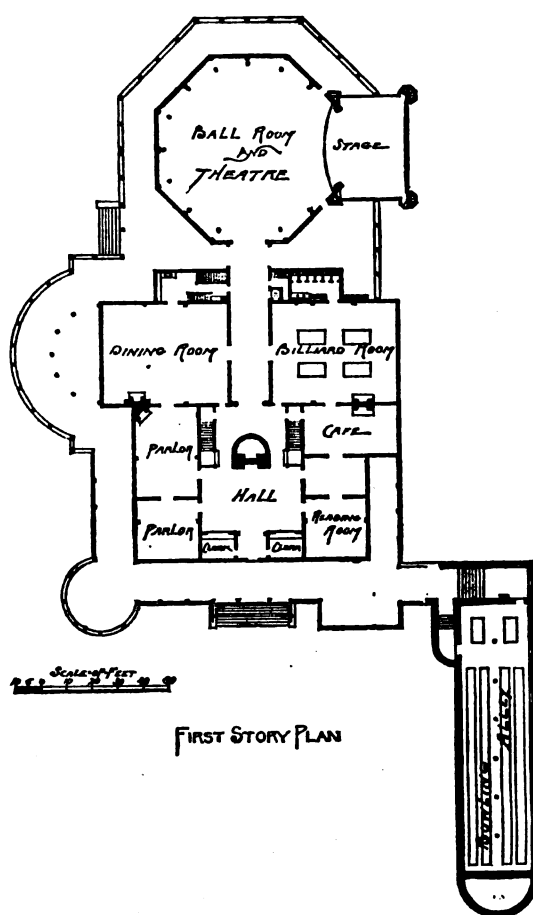
THE CLUB-HOUSE AT TUXEDO PARK, N. Y.—BRUCE PRICE, ARCHITECT.

THE Tuxedo Park Association, of which Mr. Pierre Lorillard is president, owns a large tract of land around Tuxedo Lake, Orange County, N. Y. This property belonged for upward of fifty years to the Lorillard family, and until last October was still a forest wilderness. Since then, however, great changes have been wrought under the direction of the engineer and landscape gardener, Mr. Ernest W. Bowditch, of Boston, who, under Mr. Lorillard's vigorous direction, has had complete and absolute charge of the work. Driveways have been laid out through the forest in different directions and around the lake, and a complete sewerage and water system is being introduced, so that the cottages which are being built for the members of the association on the shores of the lake and the surrounding heights will have the benefit of perfect sanitary arrangements and every modern convenience, while the lake will remain perfectly pure, the sewage being otherwise disposed of. We propose at some future time to give a full description of the sewage system and water-works of the park.

The park is but little more than an hour's journey from New York, and must prove a most attractive resort to the members of the association both in summer and winter.

The hills around the lake abound with game, and the park is well policed and the forests protected by game-keepers.

The club-house itself stands, surrounded by trees, close to the edge of the lake. A broad lawn slopes from the front



OUR SPECIAL ILLUSTRATION.—TUXEDO PARK CLUB-HOUSE.

of the house to the water's edge. The upper view on our sheet shows the lake front of the building as seen from the dam. The low circular building on the left is the theatre, as may be seen by reference to the plan. The lower view shows the opposite side of the building and the exterior of the theatre stage.

The club-house is a frame building, shingled and painted in light colors, and has panels of printed decoration under many of the windows. The decoration inside and out is the work of Mr. E. P. Treadwell, of Boston. The architect of the club-house and of the cottages is Mr. Bruce Price, of New York.

OUR ILLUSTRATION OF A MODERATE-COST HOUSE.

A COTTAGE AT TUXEDO PARK.—BRUCE PRICE, ARCHITECT.

THIS cottage stands near the lake at Tuxedo Park, and has a beautiful view across the water. It is now occupied by Mr. Lorillard.

For a description of the park, see "Our Special Illustration."

REPORT OF THE BOARD ON THE CHARGES AGAINST THE CHIEF ENGINEER OF THE NEW CROTON AQUEDUCT.

BELOW we print an abstract of the report of the board appointed to examine into the charges brought by Mr. H. S. Craven, lately Construction Engineer, against the Chief Engineer, Mr. B. S. Church. This report sustains the Chief Engineer and dismisses the charges.

To the Aqueduct Commissioners of the City of New York.

GENTLEMEN: In compliance with your resolutions of the 17th of March, in these words, namely:

"Resolved, That Messrs. John Newton, George S. Greene, and Q. A. Gillmore, civil engineers, are hereby appointed to investigate the charges made against the efficiency of the Chief Engineer of the Commission, and of imperfect work in the construction of the New Aqueduct; with full power to send for persons and papers, and to make their examination thorough and complete so far as the same relates to the engineering and construction of the work in question, and report to the Aqueduct Commissioners."

"Resolved, That the Board of Engineers be requested when the charges have been submitted to hear all necessary statements and make all necessary examinations of the work in person, at the earliest time practicable, leaving to them all the details of the manner of conducting the said examination."

The undersigned have, we believe, made a thorough examination of the subjects of all the charges presented, of the work under construction, and of the engineering management; and we herewith submit, first, our conclusions on each of the charges presented to us—viz., charges numbered 2, 3, 4, 5, and 6, recorded on pages 1 to 6 inclusive, of our minutes, and additional charges 1 to 6, of which No. 2 is a repetition of the third original charge.

Secondly—On our inspection, all of the tunnels on the north side of the Harlem River were visited, except at Shaft 23, where they were blasting at the time.

In all the work, the ventilation varies with the state of the atmosphere, but there are likewise considerable variations arising from the different systems adopted, and from the more or less perfection with which these are carried out.

The inferior method of ventilation by a wooden box into which the exhaust steam from the engine is conducted but poorly accomplishes the object, while the more perfect system of positive power, by blowers in connection with smooth iron pipes, often fails from want of capacity or bad joints, insufficient power or other imperfections in the machinery and appliances. As the lengths of the tunnels increase, all imperfections, and especially want of power, enhance the difficulty of efficient ventilation; generally the means for ventilation appear to be insufficient, and this will be particularly felt when the invert and side walls of the lining have to be laid.

In the headings when the drills are at work, the air is better than in the rest of the tunnel extending to the shaft. In this space the Aqueduct Engineers have often to work where it is difficult to remain continuously without suffering a temporary indisposition from the bad air.

The use of torches and lamps with kerosene and benzene would oppose any system of ventilation in consequence of the large amount of smoke and gases thrown out. Electric-lights with candles would constitute a much better system.

Masonry was examined (only on its external surface) in tunnels near shafts and openings Nos. 9, 12A, 12B, 14, 17, 18, and 19. The rubble masonry was of good stone as far as seen externally, and of good mortar, which was well set; the workmanship was rough, but in every respect suitable for the purpose of a back supporting wall. An exception to the general quality was a small piece of rubble and brick ordered by the Chief Engineer to be taken down. The brick masonry was made of good hard brick and strong mortar; there was one exception in tunnel south of Portal No. 9. There were some end-joints of the

brick-work not filled with mortar. This would not be discovered until the centres were withdrawn, and could have been known only to the inspector on the work; the extent of this defect can only be determined by taking down part of the work. Bricks were delivered on the work, many of which were not suitable for the masonry required, but many were well burnt and of good form. The culling should be done when such materials are delivered on the work, and the imperfect brick immediately removed as required by the specifications. Our inspection revealed the fact of the general good and sufficient quality of the masonry, but, owing to the deficiency of light, some defective parts, small in extent, may have escaped our notice. A fully satisfactory inspection of masonry can be made only during the process of construction.

On some of the brick-work laid in wet positions there is an efflorescence of salts on the face of the wall; this is common in hydraulic masonry (it is usually from magnesia or potash in the cement) and is not injurious to the work.

The extent of the timbering used shows the treacherous character of the rock in the roofs of the tunnels and the necessity for carefully supporting them.

The findings on the several charges marked A, B, C, D, E, F, G, H, I, K, and L are hereunto annexed.

Briefs of testimony in charges 2, 3, and 4 are herewith presented, as are also the minutes of our proceedings.

The examining engineers inquired into the methods of the Chief Engineer's office for the conduct of the work under his supervision. A well-arranged system exists for furnishing drawings and instructions to the division engineers and for receiving from them returns and other incidents concerning the work. The condition of the ventilation, the quantities of water raised from the tunnels, and other occurrences of interest, are reported.

Detailed estimates of work of every kind are furnished monthly.

The system works well, and by it the Chief Engineer is enabled to have before him at all times a history of the progress and condition of the work.

The excavation of the tunnel and the masonry which has been constructed indicate the general efficiency and competency of the engineering force. The management under this system appears to be efficiently carried on.

Our thanks are due to your Secretary, Mr. James W. McCulloh, for the prompt and efficient aid which he rendered to our labors in many ways, besides furnishing official records, and assisting in making up our minutes and reports.

His knowledge of the records and of the management of the business of the department gave to his co-operation a particular value. Respectfully submitted,

A. CHARGE SECOND.

That masonry condemned by the Engineer of Construction, two assistant engineers, and three inspectors was accepted by the Chief Engineer.

Specification.

The masonry referred to is the rubble-stone masonry at the Saw Mill River crossing of the New Aqueduct, between Shafts 12A and 12B, on Section 6.

For that class of masonry the requirements of the contract specifications (clause 44, page 20 of contract) are as follows:

"44. Rubble-stone masonry shall be made of sound, clean stone of suitable size, quality, and shape for the work in hand, and presenting good beds for materials of that class. Care must be taken to have the beds and joints full of mortar, and no grouting or filling of joints after the stones are in place will be allowed. The work must be thoroughly bonded."

"Rubble-stone masonry is to be used for the side walls and foundations of the aqueduct when it is built in open trenches, and in any part of the tunnel or other part of the work where it may be ordered."

"In the tunnel, especially, the size and shape of the stone used must be adapted to the spaces to be filled, in order to secure absolutely compact work."

"Stone from the tunnel or other excavation may be used when suitable."

The attempt to prove the bad and insufficient character of the masonry of this wall so entirely failed, without the necessity to urge anything in rebuttal, that the Examining Engineers find no difficulty in dismissing the implication in the charge that Chief Engineer Church neglected his duty by accepting the wall. The wall, on the contrary, is shown from the testimony to have been built of strong and suitable materials, both as respects stone and mortar, and also to be in conformity to the specifications of the contract in materials and workmanship, and that it was fully adapted to the requirements of the case.

CHARGE THIRD.

"That Contractors O'Brien & Clark have not withdrawn timbering from the roof of the tunnel, or filled in the space with stone, as required by the specifications, but have filled in the space with logs and timber, thereby endangering the masonry of the aqueduct."

Specification.

"The work to which this charge refers is at or near Shaft 12B, on Section 6, of the New Aqueduct."

The requirements of the contract (Section 6, Clause 20, page 13) are the following:

"20. The spaces between the top of the arch and the rock or other material of the excavation, or any other space which may be designated by the engineer, are to be filled, at the expense of the contractor, with material excavated from the tunnel, of approved size and quality, and free from all perishable matter. The filling to be carefully and thoroughly compacted so as to bring a uniform pressure on the masonry."

"The extrados of all portions of the arch, when in contact with the filling, is to be covered, at the expense of the contractor, with a coating of cement-mortar not less than 1/2-inch thick."

And Clause 27, page 15:

"27. All timber-work is to be removed from the excavation, but if, in the opinion of the engineer, any timber-work be so located in the tunnel or shaft or trenches that its removal would endanger the safety of the masonry, it shall be left in, and all cavities about it shall be filled with masonry or with such other material as he may order. But no payment is to be made to the contractor for such timber."

The charge preferred by Mr. H. S. Craven, late construction engineer, is, briefly, not attempting to withdraw timbering or lagging, the space between lagging and rock roof of tunnel being filled with wood.

The examining engineers hold that the timbering was not withdrawn or the lagging in this dangerous place, the Chief Engineer having decided in conformity with Clause 27, before quoted, that they should remain. To have removed these supports, which held up the rock roof, would have brought the weight of the loose rock upon the fresh masonry to its probable injury. The question, after all, was not of the possibility of removing the timbering but of the propriety of so doing, and it would have been very reprehensible under the circumstances as found to exist to have taken away the timbering. It is not probable that the timber will decay owing to its exposure to constant wetness, but, should decay take place, the masonry before that period will have acquired sufficient strength to support any weight which will come upon it.

The timber on the sides of the tunnels below the water-surface in the aqueduct will always be wet and will not decay.

The examining engineers, therefore, acquit the Chief Engineer of the commission of any fault which is alleged in this charge and specification.

C. CHARGE FOURTH.

"That on the 5th Division of the New Aqueduct (Shafts 17 and 18) timber once paid for under the charge for 'excavation,' is, by order of the Chief Engineer, and in violation of the specifications, again being measured and paid for as 'rubble-stone masonry.'"

Specification.

The timbering referred to is upon Sections 8 and 9 of the New Aqueduct, and between Shafts 17 and 18.

The requirements of the contract bearing upon the matter of this charge are:

First—Clause 21, pages 13 and 14:

"The price per cubic yard, stipulated herein for tunnel excavation, is to cover all expense due to the presence of quicksand or other soft material, rotten rock, boulders, etc., the cost of pumping and bailing, of all timbering and removal of the same, of removing all excavated materials, of all ventilation, and of all other work incident to the excavation of the tunnel. Any expense that may arise from loose and shaky rock or from falls or cave-ins, or from unexpected obstacles, shall be borne by the contractor."

Second—Clause 27, page 15:

"All timber-work is to be removed from the excavation; but if, in the opinion of the engineer, any timber-work be so located in the tunnel or shafts or trenches that its removal would endanger the safety of the masonry, it shall be left in, and all cavities about it shall be filled with masonry or with such other material as he may order; but no payment is to be made to the contractor for such timber."

The formation of a correct judgment on this charge is a simple matter. The phrase, "timber once paid for under the charge for excavation," is a mere quibble. The amount paid for is the volume of the tunnel or other excavation, calculated according to the several clauses of the contract provided for that purpose. And no timber is mentioned or paid for in that settlement. The clauses of the contract above quoted provide that the timber shall be removed. In the cases where the timbering is removed, would it be claimed that the sticks belong to the public or to the contractor? and would the contractor be debarred a future use of the same sticks in other parts of the works? A little consideration given to these points makes it even more clear that the timber is not paid for as excavation.

The contract provides that under certain circumstances the timber-work "shall be left in, and all cavities about it shall be filled with masonry or with such other material as he" (i. e. the Chief Engineer) "may order," and the sole question to be adjudged is: When the timber is thus enveloped in masonry, what measurement of that masonry is just, proper, and usual? In our judgment, the just as well as usual rule is to include the space occupied by the timbering in the estimate for masonry, and the spaces thus included and counted as masonry do not compensate the contractor for the increased expense of working around these timbers, which thus left in position and under the conditions fulfill the duty of masonry.

We think, the Chief Engineer, under Clause B of the contract, had full power to decide cases like this; that his decision was just toward all parties, conformable to custom, and entirely correct.

D. CHARGE FIFTH.

That attempts have been made to prevent his honest supervision of the work.

After maturely weighing the testimony, the Examining Engineers find no fault to attach to the conduct of the Chief Engineer under the fifth charge.

E. SIXTH CHARGE.

That by reason of his (Mr. Craven's) discovery and correction of the erroneous and excessive measurements of masonry on Division 3, he was thereupon ordered by the Chief Engineer to cease examining and approving the monthly estimates except clerically.

Under the sixth charge the board discusses the reasons which led Mr. Craven erroneously to suppose that the measurement of masonry for the month of November, 1885, on the Third Division was incorrect. The error, however, was in the "incorrect plotting of accurate measurements." The estimate had not yet reached the Chief Engineer, and, before payment could be made, it had to pass under his inspection and be confirmed. The board concludes that the Chief Engineer was in no wise concerned in the difficulty (at the stage it had reached), and discussion between Mr. Craven and Mr. Wolbrecht, Engineer of the Third Division. The board finds that the Chief Engineer in confining the examination of estimates by the construction engineer to clerical work was entirely justified by the by-laws and by the circumstances of the case.

FIRST ADDITIONAL CHARGE.

"Slopes have been estimated and paid for in direct violation of the specifications."

This refers to the open cut in earth at South Yonkers. The width at bottom was what was required for the masonry and the timbering to support the earth during construction. The sides were vertical to the height of the covering embankment over the arch, at which level the width of the cut was increased and the sides sloped $1\frac{1}{2}$ to 1. This additional width was proper for ditching and the slopes were necessary and were a proper arrangement for finishing the sides of the cut. The removal of the extra thickness of earth above the arch was intended to equalize the load thereupon.

The engineer, in our opinion, has full authority under the contract to establish the lines of the permanent surface of the cut, and we think the arrangement made was proper and necessary.

The surplus earth was used properly for embankment at another point of the open cut, and this was an economical arrangement for the city by which the expense of *borrowed earth* was saved.

THIRD ADDITIONAL CHARGE.

"Sub-letting the work in violation of the contract."

We do not think the contract controls this matter of compensation between the contractors and their employees.

FOURTH ADDITIONAL CHARGE.—PAGE 191 OF THE MINUTES.

"Giving special contracts to the contractors for ditching and diverting streams through dumping grounds; though the specifications provide that this work shall be done by the contractors at their own expense."

The clause of the contract referred to is section 47, page 24, of the general form of contracts, as follows:

"47. At his own expense and under the direction of the engineers, the contractor is to clear the aqueduct from all refuse and rubbish, and to do about the shafts all grading that may be ordered; to do all ditching and diverting of streams, and to leave in neat condition the ground occupied by him."

The work here referred to was the building of culverts to carry natural streams across dumping grounds, so that the dumping would not be interrupted. This was not the ditching which the contractors were required to do at their expense. The object was to enlarge the pumping grounds by filling over the streams where the culverts were made. There was not ground at the shafts in possession of the Aqueduct Commissioners on which to divert the streams.

The work having been done under contracts made by the Aqueduct Commissioners, it is not the subject for criticism by us, excepting in so far as it was recommended by the Chief Engineer. The testimony shows that the work was necessary and proper, and outside of the requirements of the contract.

FIFTH ADDITIONAL CHARGE.

"Ordering additional shafts where not necessary, and which should not have been allowed, as they involve unnecessary expense to the city."

The contracts authorize additional shafts in the discretion of the Aqueduct Commissioners on Sections 2 to 9 inclusive, and on other sections, within the limit of cost of \$5,000; the shafts that were ordered were so ordered to facilitate the completion of the work, where unexpected

difficulties had occurred. We believe they were justly ordered and that the Chief Engineer only fulfilled his duty in so acting.

SIXTH ADDITIONAL CHARGE.

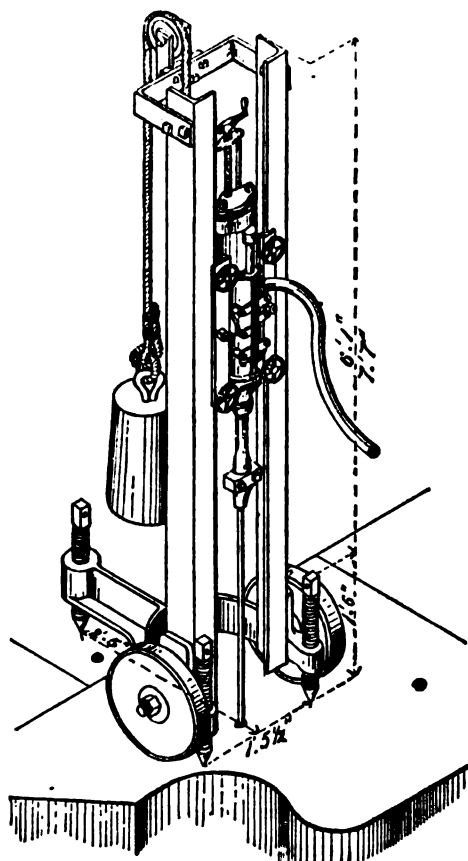
"Payment of the employees of the contractors in store orders contrary to and in direct disobedience of the terms of the contract."

The contract requires that the contractor "will punctually pay the workmen who shall be employed on the aforesaid work in cash current, and not in what is denominated store pay." By this we understand that the men shall not be required to take their pay in goods or merchandise, which is what is technically called "Store Pay." No evidence was obtained that such was done by the contractors. We do not think that selling goods on credit or for cash by the contractors or by persons serving under them to the men is in violation of the contracts. No complaints have been made and the Chief Engineer does not know of any men being required to take their wages or compensation in "Store Pay."

PORTABLE DRILL USED ON THE ELK RIVER SHOALS IMPROVEMENT.

We have received the annual report of Major William R. King, of the U.S. Engineers, upon the "Improvement of the Tennessee and Cumberland Rivers, and of certain rivers in Eastern Tennessee and Kentucky." The work of principal interest is that on the first two. On the Tennessee above Chattanooga the work has been that of removing bars, reefs, and shoals, and building wing and retaining dams so as to secure a depth of three feet at low water. There have been \$218,350 expended, and \$81,500 are needed for completion. Below Chattanooga a canal 70 feet to 120 feet wide and 6 feet deep, with 9 locks, 300 feet between gates, and 60 feet wide, with a total lift of 94 feet, is building around Big Muscle Shoals. These locks are completed ready for the gates. The Shoal Creek Aqueduct, 900 feet long, is completed, and the canal nearly completed.

Around the Elk River Shoals two locks and $1\frac{1}{2}$ miles of canal are required, and the Little Muscle Shoals are to



be improved. The total expenditure has been \$2,575,000, and \$1,437,500 are required.

On the Cumberland there has been less work done. A channel $3\frac{1}{2}$ to 4 feet deep is proposed, at a total cost of about \$4,250,000, of which about \$300,000 has been expended.

The steam excavator used at Elk River Shoals was designed by Major King, and is intended for excavating by the use of scraper and plow for 100 feet width and but a few feet in depth. These are propelled by chains about 250 feet long, of $\frac{3}{8}$ -inch iron, branch chains, 15 feet long, attaching them to the excavating tools. The branch chains are joined by swivels to the main chains to overcome the difficulties from twisting. The chains pass over grooved chain pulleys, provided with lugs to prevent slipping, the

axles being inclined so as to make the chains lead fair, and the pulleys being on the prolongations of the axles below the frames. The propelling engine, barrels, etc., are on a small car moved along on temporary track, and the rope passes around another pair of grooved pulleys on a similar car loaded with stone for stability on a track on the opposite side of the canal. The swivels allow the branch chains to pass around at the pulleys without twisting.

Another novelty (see Figure) was a portable wrought-iron frame on wheels for moving quickly a rock-drill. When in use, three pointed screws were turned down so as to take the weight. The drill was mounted between two slides in such a way that it could be moved quickly up and down and held firmly by hand-nuts, the weight being counterpoised. This apparatus saved the time required for changing drills for deep holes, since long drills could not be used.

HEATING AND VENTILATION OF THE CHAMBER OF DEPUTIES, PARIS.

OF the report prepared by M. Edmund de Joly, architect of the Chamber of the Corps Legislatif, Paris, for the information of a committee of the House of Commons, England, on the general arrangements, etc., of the chamber, we take the following abstract from the *London Architect*:

GENERAL ARRANGEMENTS OF THE CHAMBER.

The chamber is semi-circular in form, and is 32 metres 48 centimetres, or 100 feet in diameter. Its height, taken from the flat part of the floor to the ceiling, is 14 metres 62 centimetres, or 45 feet.

The circumference of the semi-circle is divided into nineteen bays by eighteen marble columns, carrying an entablature on which rests a circular cove, forming part of the ceiling of the chamber, which is pierced in the centre by a semi-circular skylight.

This chamber was at first arranged for 500 places. There were ten tiers of seats with backs, divided by seventeen gangways, nine of which start from the semi-circle in front of the Speaker's tribune to the height of the last tier, while eight start from the passage made half-way up these same tiers.

The number of deputies being now only 283, a smaller number than at the time of the construction of the chamber, the seats on the two last tiers have been removed.

There are now, therefore, only eight tiers of seats, subdivided as we have just described; they can only seat two, three, or four deputies at the most, an arrangement which allows of a free circulation and ready access to all parts of the chamber.

Before each seat, at a convenient distance for writing, is placed a separate desk, furnished with a lock and key, for each deputy.

The floor of the tier on which the last seat is placed is raised 2 metres 68 centimetres above the floor of the semi-circle in front of the President.

The orator's tribune occupies the centre of the semi-circle. Its floor is raised 1 metre 10 centimetres above the floor of the semi-circle. Behind the orator's tribune is the President's chair, raised 2 metres 25 centimetres above the floor of the semi-circle. Lower, on the right and left, are the places of the Assistant Secretaries elected by the House. In the reserved space behind the President's desk is the place of the Secretary General of the Corps Legislatif.

A first tier of boxes, 3 metres in height, above the last tier of the chamber, occupies the circumference of the semi-circle, except one space in the centre of the colonnade. These boxes are reserved for the Emperor's household, the Corps Diplomatique, the Senate, the Ministers, the Council of State, the President and Vice-President, and the Quæstors, and a part reserved by tickets for the deputies. The number of places in the boxes of the first tier is 288. A second tier, which runs behind, and at half the height of the columns contains other boxes, of which one is public, and the remainder are given to the deputies in order. The number of places in the boxes of the second tier is 224.

WARMING.

We will first deal with the question of warming the chamber, in order to bring the temperature before the sitting to a sufficient degree of elevation, the warming during the sitting being dealt with under the head of ventilation.

The warming is effected exclusively by hot-air stoves heated with coal. These stoves, three in number, placed under the semi-circle of the chamber, can throw out a quantity of heat capable of raising, per hour, 16,000 cubic metres of air of 30° C. (86.2° Fah.) The normal tempera-

ture of the chamber in winter, at the opening of the sitting, ought to be 16° C. (60.8° Fah.) Each stove is so constructed that the surfaces exposed to the fire may be proportional to the above conditions. The air which supplies these stoves reaches them after having made a long circuit in the cellars which are arranged for this purpose. The heated air is conducted to a reservoir formed in the cellars exactly under the semi-circle of the chamber. From this reservoir it can at will be introduced into the chamber either (1) by openings made in the risers of the steps of the first tier of seats and by openings in the flat part of the floor, or (2) by apertures under the seats of the deputies, or (3) by openings made under the floors of the boxes of the first tier, and by openings made in the cove of the chamber. But the warming, properly so called, of the chamber takes place commonly only by the first openings, the second being specially applied to the exit of the vitiated air, and the third to the introduction of the fresh air, as, indeed, we shall say further on in the article on ventilation.

VENTILATION.

We shall first call attention to the mathematical conditions of the problem to be resolved. A chamber of a superficial area of 580 square metres (6,243 square feet), and containing about 9,060 cubic metres (319,972 cube feet); a variable number of persons present, which may, at a maximum, be 883; no natural entrance or exit for air, such as window openings (we take no account of the doors of the chamber); an assembly composed of members of different ages and temperaments, occupying always the same places.

As to the history of the ventilation of the chamber, it can be divided into two quite distinct parts, according to the two systems which have been followed. In the first period, until 1860, the air, hot in winter, cold in summer, used to come in through the risers of the steps under the seats of the deputies, and was extracted at the upper part of the chamber. In the second period, the present, the air enters at the upper part of the chamber, and is, on the contrary, extracted at the lower part.

We will first point out how the ventilation of the chamber was conducted under the first system. The air entered the chamber by a set of orifices made in the risers of the steps in front of the desks of the first tier, and at the same height in the dwarf walls carrying the other tiers, and under all the seats of the deputies. The vitiated air escaped by a set of openings in the circular wall of the chamber, by means of gratings placed under the supports of the low boxes communicating with a general chamber formed under the floor of the boxes all round the chamber. This chamber was placed in communication with two shafts made in the thickness of the walls near the semi-circular staircase. In the ceiling of the first tier there existed a set of orifices which were in communication with the chamber, made under the seats of the boxes of the second tier. This chamber was connected with a circular flue above the ceiling of these boxes. In the same ceiling were placed circular ornamental openings, covered with a trellis brass wire, so as to establish a communication between this chamber and that above the boxes of the second tier. Immediately above these was an up-cast furnace, arranged so that all the fuel consumed there served to quicken the current of air. The two shafts joined together in one, in the space behind the pediment of the façade of the chamber facing the quay. At the point of union was placed a ventilator acting by centrifugal force, moved by hand, which acted or not, according to necessity and circumstances. Its use was quickly abandoned. The sectional areas of ingress and egress were about three square metres (32.292 square feet).

The reservoir of the air is a large cellar communicating with the chamber, with the stoves which draw thence the cold air and send back the warm air, and with the exterior by means of passages established in the cellars, so that the air should be compelled, before arriving at the reservoir, to traverse the route allotted to it in the cellars.

The arrangements made for transforming the system of ventilation which was, so to speak, reversed, so that the emanations of cutaneous transpiration might be drawn off before they had been able to rise and mix with the air to be breathed. One observation should be made at starting; it is that the arrangement of the buildings offered difficulties which would not exist in new edifices, so that we were forced, on the one hand, to make arrangements less simple than could have been wished, and on the other to be contented with sectional areas, smaller than we could have desired to give.

The relative narrowness of the flues and orifices of ingress and egress demands, as a compensation, a strong up-cast kept up by a fierce fire, and besides may be the cause of draughts produced by this very rapidity of circulation, which is rendered compulsory as a necessary compensation for the relative insufficiency of the sectional areas of the ventilating apertures. The sessions of the Corps Legislatif open, as is known, generally at the end of January, and last till the end of June. The sittings can, therefore, be divided into winter and summer sittings. We call those winter sittings at which the cold air of the reservoirs cannot be introduced into the chamber without having been rendered temperate by a mixture of warm air. The summer sittings, on the contrary, are those at which the air of the cellars is introduced at its ordinary temperature.

Before studying each part of the mechanism we will give a general idea and summary of the method of procedure, according to the seasons which we have just indicated, and will begin with the winter sittings.

The introduction of the air presents two phases, one before the arrival of the deputies, during which the chamber must be brought to a moderate temperature, which is rarely raised above $16\frac{1}{2}^{\circ}$ C. (60.89° Fah.) During this time no rush of air is resorted to, and the warm air, as we have said, is introduced by openings communicating with the reservoir of warm air, and passing through the floor at the lowest point. In the second place, after the commencement of the debate, according to the greater or smaller number of persons present, a part of the vitiated air must be drawn off and replaced by pure air. The reservoir of warm air supplies by means of flues the mixing-chambers to the number of seven, which are themselves supplied with cold air drawn from the cellars, which serve as a reservoir of cold air, so as to admit into the chamber only air of moderate temperature. From the mixing-chamber start vertical flues, ending in the first circular flue placed under the floor of the first tier of boxes, and in a second circular flue placed above the cove of the chamber.

The air thus introduced into the chamber is driven out through the orifices made under the seat of each deputy, in the flat part of the floor of the chamber, and in the circular corridor at the top of the tier of seats. These orifices open into circular flues placed under the tiers of the chamber. These flues are in communication below with two up-cast stoves. The summer ventilation differs in nothing from that used in winter, except that the air of the cellars coming from the reservoir of cold air is introduced into the chamber at the temperature of the cellars themselves, which varies from 14° , 15° C. (57° , 59° Fah.)

We will now study each part of the mechanism of this system.

THE WARM-AIR CHAMBER.

This chamber, placed under the semi-circle of the chamber, serves as a reservoir for cold air in summer, being even more inaccessible to variations of temperature than the cellars of the palace, which are not completely protected from them. It presents a superficial area of 130 metres (1,399 square feet), its height is about 3 metres 20 centimetres, and its cubic contents 416 cubic metres (14,692 cubic feet). The stoves are placed there, but not the furnace-mouths. Seven orifices regulated by valves of a superficial area of 6 metres 17 centimetres (64.6 square feet) are used for the introduction of cold air in this air-chamber. From this reservoir issue seven flues, which end in the seven mixing-chambers to which they carry warm air in winter. These flues, at their exit from the reservoir, and at their entrance into the mixing-chambers, are regulated by valves. The sectional areas of the flues and of the openings into the mixing-chambers are 4 metres 98 centimetres (43.221 square feet).

MIXING-CHAMBERS.

The mixing-chambers are seven in number. This number is to be regretted for the complication of the mechanism, and also for the difficulty of precision in handling. Four of these chambers are placed in the cellars. Three are placed on the ground floor of the chamber.

We have said that the ingress apertures for warm air were of a total sectional area of 4 metres 98 centimetres (43.2 square feet). The ingress apertures for cold air, also regulated by registers, are of a superficial area of 4 metres 28 centimetres (43 square feet). The warm air flows in nearly parallel to the current of cold air, by means of partitions of metal or masonry, the warm-air flue being below that for cold air. The capacity of these mixing-chambers, of which the largest is only 9 metres 288 centimetres, is, by the arrangement of the

buildings, unfortunately small. Valves allow instantaneous variations to be made in the temperature by proportioning, according to the requirements, the passing currents of warm or cold air.

ASCENDING CURRENTS.

Vertical flues, introducing the air into the chamber, issue from the mixing-chamber. Six of these flues end in circular flues placed under the boxes of the first tier. Their total sectional area is 2 metres 504 centimetres (22.071 square feet). They are nearly regularly arranged around the chamber. Four of these flues end in circular flues placed above the cove of the chamber. Their total sectional area is 1 metre 895 centimetres (11.727 square feet). Valves placed in the mixing-chambers, at the point of departure of the ascending currents, allow the current of air introduced into the chamber to be regulated. Thermometers are placed within sight in the currents to show the temperature of the air introduced. Divisions are placed in the circular flues to lessen the effects of the currents at the points of ingress, by guiding the air in the flues.

INTRODUCTION OF AIR INTO THE CHAMBER.

The gratings for introducing the air into the chamber, corresponding with the circular flue under the flooring of the boxes of the first tier, in number equal to the intercolumniations, give a superficial area of real opening of 2 metres 80 centimetres (21.614 square feet). They are placed under the supports of these boxes. There being no freedom of choice in consequence of the requirements of the construction, the gratings, used under the first system for the exit of the vitiated air, have been employed for this purpose. The gratings of introduction, which correspond with the circular flue above the cove of the chamber, are nineteen in number, of a real superficial area of 4 metres 446 centimetres (43.537 square feet). They did not exist under the first system of ventilation, and their superficial area might have been increased if that had not been useless, considering the sectional areas of the ascending currents.

ORIFICES FOR THE EGRESS OF VITIATED AIR.

The orifices for the egress of vitiated air are placed—(1) in the risers of the stairs in the gangways; (2) in the corridor running behind the seats of the deputies; (3) under the seats of the deputies; (4) on the surface of the semi-circle or flat part of the floor. The superficial area of these orifices is 4 metres 68 centimetres (43.13 square feet.)

CONCENTRIC AIR-PASSAGES.

The orifices of ingress end in concentric air-passages, uniting themselves into four flues, which open into the ventilating-shafts. The sectional area of these flues is proportional to the orifices of egress. These different concentric air-passages divided, first, into two separate parts on the right and left of the chamber, are besides subdivided in such a way that, by the aid of the arrangement of the valves, the exhaustion of the vitiated air can be accomplished from each part of the chamber separately. The exhaustion of the vitiated air can also, by the aid of special arrangements, take place, either solely by the openings made in the risers of the stairs in the gangways, or by the orifices made over the whole surface of the chamber.

STOVES, UP-CAST SHAFTS.

All these air-passages unite into four flues, ending in two special shafts, their sectional area, unfortunately small (for it was necessary to get them in the unappropriated spaces of the building), is 2 metres 44 centimetres (21.576 square feet). The furnaces at the base of these shafts contain coal fires, the heat of which causes the extraction of the vitiated air, and, secondly, the entrance of the pure air. Such is the mechanism of the system of ventilation. If we had to express our opinion upon it we should say that, correct in its principles, it is insufficient in its application, and we could wish to see the superficial area of the orifices of ingress and egress of the air increased to 8 metres (86.115 square feet).

COOKING APPARATUS AND PLUMBING IN THE SAILORS' SNUG HARBOR, STATEN ISLAND.

FREQUENT inquiries as to the capacity of steam-cooking apparatus and kitchen for a given number of persons induced us to visit the buildings of the Sailors' Snug Harbor at Staten Island, N. Y., and describe just what experience has demonstrated to be sufficient in that institution.

Before going into the details of these kitchens and cooking apparatus, however, we wish to explain that this can only form a basis for kitchen and apparatus for similar

institutions, or at least for institutions where the inmates are fed and catered to in a manner such as would be expected to exist in a sailors' or soldiers' home, asylums of any kind, or soldiers' quarters. For prisons, the plant would not be so elaborate, and the roasting is generally done in a different manner, and for hotels or places where the guests do not sit down at once, but at pleasure, over a period of three hours or thereabouts, an entirely different class of plant is required.

At the Sailors' Snug Harbor there are two kitchens—one for the principal building, and one for the hospital.

Figure 1 shows a ground plan of the principal kitchen built in 1876. It is 60 feet long, by 30 feet wide, by 12 feet high beneath the iron joists. The side walls are red smooth bricks, painted. The ceiling is formed with iron joists and narrow brick arches, plastered and painted, and the floor is of rubbed bluestone flags.

To the left, as you enter, is a 12-foot French range. Occupying the whole width of the (east) left wall are

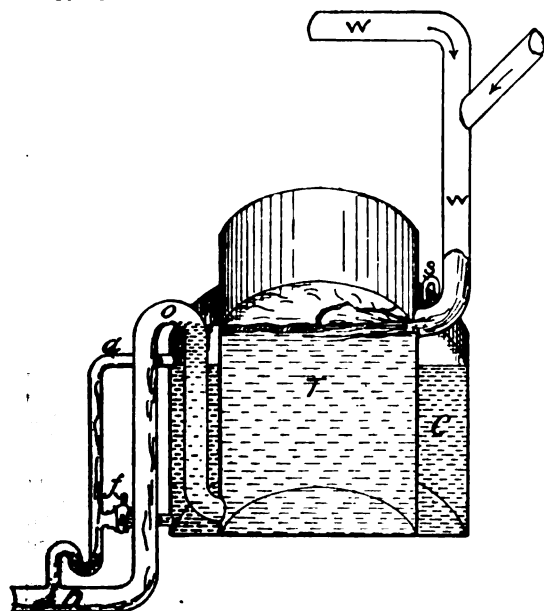


FIG. 2.

twelve cast-iron roasting-ovens. These ovens require a floor-space of twenty-seven inches wide by thirty-three inches deep, and we have the statement of the chief cook that he can roast 700 pounds of meat in the twelve ovens in $1\frac{1}{2}$ hours' time with forty pounds pressure of steam. The kettles are cast-iron, with double bottoms and double sides for about two-thirds of their heights; the double side forming a terrace or step on the inside of the oven. It is within this space the steam circulates. Tight-fitting heavy covers fit over one-half the top to retain the hot vapors given off; by the meats. It is stated on the

right of the warming-closets are four 40-gallon urns. Two are used for coffee, one for tea, and one for hot water. To the right of these are three 80-gallon copper kettles, and in the corner is one 60-gallon. Large iron hoods shown by the dotted lines come down well over the kettles and urns, and connect with vent-flues in the walls; fourteen vent-flues in all—some of which are shown—each one foot square, connect with a shaft at the apex of the roof, within which is a steam-coil to move the air.

At the position marked C M there is a chopping-machine. The stairway to the right leads down into a vegetable cellar, and the position of the ice-box and sinks are plainly marked.

A cast-iron surface-drain is let into the flags in front of all the cooking apparatus except the range. Its position is plainly marked, and the darts show the direction of its flow or pitch. The drain is eight inches wide where it is let into the flags, and perforated depressed covers in short lengths (about 24 inches), 5 inches wide, form the top. The warming-closets are each 5' x 5' in plan and 6 feet high. They are lined with zinc and have flat steam-coils at all sides but the doors. Peculiar made wooden racks on wheels sufficient to hold all the crockery for a meal for 600 to 700 persons can be packed on them and rolled into the closets. A temperature of about 175° Fah. can be obtained on the dishes, etc., so that they can all be distributed on the tables and still be sufficiently warm in cold weather when it is time to sit down. Tracks from the kitchen run to the dining-room to convey the food. Between 600 and 700 persons sit down here at one time.

In an institution composed of persons all past their labor there is necessarily always a large percentage in the hospital. About 125 is the average in this case. In the hospital building there is consequently a separate kitchen with dimensions about 45' x 30' by 12 feet high. The floors are rubbed bluestone flags with cast-iron drains, similar to that used in the main kitchen, and the walls and arched ceiling are glazed bricks, the prevailing color being cream, with blue and chocolate intermixed in tasteful design, with chocolate wainscoting. Eighteen vent-flues of one square foot each start from near the ceiling line and run to an aspirating-shaft in cupola at the top of the house. This shaft is warmed by a steam-coil.

This kitchen has one six-foot range, four forty-gallon copper-stock boilers, one twenty-gallon copper boiler for chicken broth, and one roasting oven.

The potatoes or vegetables in this institution are cooked in stock-boilers instead of vegetable-steamers.

A peculiarity of the main kitchen is its grease-trap, shown in Fig. 2. The accumulated grease from the kitchen-sinks, etc., gradually filled a twelve-inch sewer until it became inoperative. The engineer—Mr. Miles—being unable to find a grease-trap in the market large enough for his purpose, contrived the one shown. It is com-

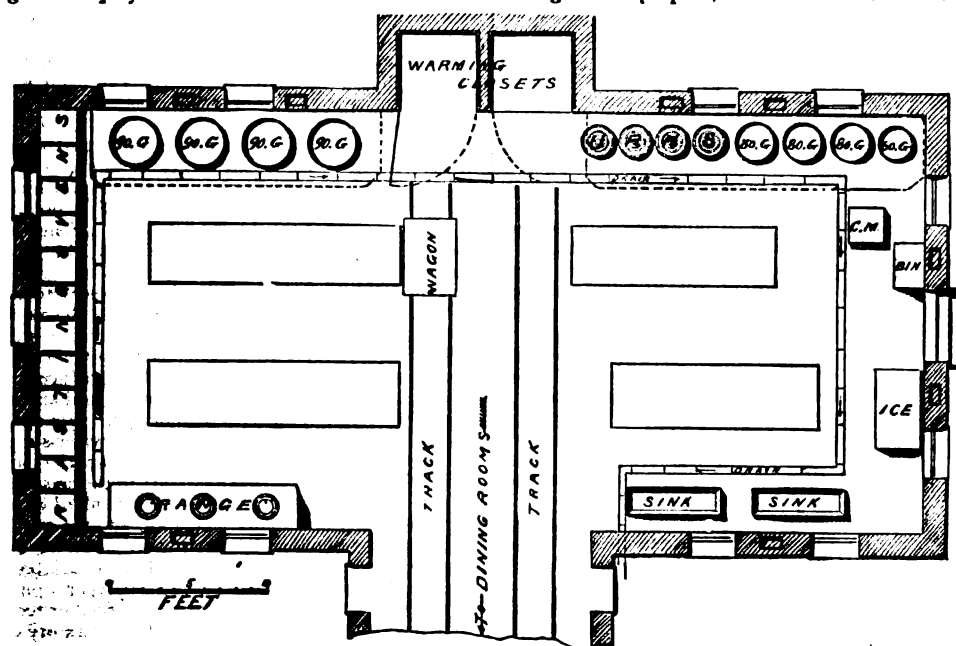


FIGURE 1.

authority of the officials that meats that would be otherwise undesirable as roasts—such as round and rump—comes from these ovens tender and somewhat resembling "pot-roasts," but withal nicely browned.

On the south wall, to the left of the warming-closets, are four 90-gallon copper stock-boilers. These can be used either for vegetables or meats, or farinaceous foods, but they are principally for meats and soups. To the

posed of an outer casing, C, of galvanized iron, twenty-four inches deep by thirty-six inches in diameter, and of an inner one, T, thirty-six inches deep by twenty-four inches in diameter, one within the other. The outer one is filled with cold water through the pipe S, which is set running in a small stream when dishes are being washed and at other suitable times. This water overflows through the pipe a, and a pipe, f, with a cock, is provided for drawing

it empty, should this be required. The waste-pipes, w w, are from the kitchen-sinks, etc., and enter the receiver T at the water-line. A syphon-outlet, O, is provided from the bottom of the receiver and overflows into the drain D. The grease floats and is cooled by the mass of water, the sink-water running off by the syphon. The grease is lifted from the water once a day, after dinner, by the attendant.

ESSAYS READ AT THE MASTER PLUMBERS' CONVENTION.

IN our issue of July 8 we printed abstracts of several essays presented at the Deer Park Convention of the National Association of Master Plumbers. We here give selections from several others.

SHOULD SANITATION BE FOSTERED BY LEGISLATION?

PRESENTED BY THE MASTER PLUMBERS' ASSOCIATION OF CINCINNATI, O.

TO ANSWER the question, "Should sanitation be fostered by legislation," it is pertinent to inquire, What is comprehended by Sanitation? My reply to that query is that sanitation consists in the use of such appliances as wisdom would suggest and science approve of, as being necessary for the prevention of disease and consequent promotion of health and preservation of the lives of individuals and communities. In the adaptation of such appliances the plumber is both the scientific and mechanical factor. Therefore the plumber, both by precept and practice, is the best and safest authority to consult in such matters. * * * It is a self-evident and indisputable fact that whatever promotes health is a preventive of disease, and, *vice versa*, whatever promotes disease is a destroyer of health. The promotion of health and the preservation of life is a universal aspiration of humanity, and while it is the desire of all to be possessed of good health and to do what they can to ward off disease and death, in an especial sense, it is both the province and the duty of plumbers, physicians, and all other sanitarians and humanitarians, vigorously to co-operate together and become the vanguard of the army of science, boldly attack the citadels of disease wherever found, demanding the enactment of such laws as will compel compliance with the sanitary conditions that will best secure the universal desideratum of good health. The health of a community is paramount to all its other considerations, but, alas! in this important matter we permit avarice and ignorance to control us. These are the twin giants that stalk abroad at noonday, and hurl defiance in the face of reason. They are the monster obstructions that antagonize science, cripple effort, and oppose human progress. Hence, in all of our cities civilization is largely a misnomer, for while we may point with pride to the few who are surrounded by the highest conditions of human comfort, it is to our shame and disgrace that we can also point to many who are engulfed in the lowest depths of human misery. * * * And when in the full and free exercise of our gigantic ignorance we expect the denizens of those tenement rookeries under such conditions, properly to propagate their species and raise them to become reputable citizens, we are simply expecting the impossible. Such causes can produce no such beneficent results, as the police-court records of any city will amply testify, and herein is where the government of a free republic is both cruel and despotic, in punishing its subjects for violations of its declared proprieties, while it fails to enforce conditions capable of producing different results. Our knowledge of the general laws that govern human life and the conditions under which it is best developed are already of that character and extent as will warrant those who have made such a study a part of their profession to speak with authority, and individual interest and public welfare demand that scientists proclaim to diseased and suffering humanity that it is natural law which governs human life, disease, and death, and these laws are as immutable as that of gravitation. If thoroughly imbued with such knowledge the people would demand their surroundings to be put in the highest state of sanitary excellence. Then woe unto that branch of government—legislative, judicial, or executive—that fails to come up to their just requirements! Legislation was founded by ancient patriots, but it has been sadly confounded by modern politicians. Patriot and politician are no longer synonymous terms, hence the difficulty in getting the average politician to exert himself in the interest of sanitation. That sanitation should be fostered by legislation is demanded by every consideration of justice and expediency, and just as we advance in sanitation in the same ratio shall human ills depart and human comfort increase.

THE DRAINAGE OF PRIVY-VAULTS.

PRESENTED BY THE BALTIMORE ASSOCIATION.

THE subject of the essay assigned to the Baltimore Association is, "The Dangers of the Privy-Vault." Should it be dispensed with entirely? If used, how can it be without danger and becoming a nuisance? If not used, what can take its place in small towns and country places? The dangers of the privy-vault might be briefly summed up as follows: It poisons the two greatest life-giving elements, air and water, without which it is impossible to sustain human life. There is abundant testimony to prove that the foul exhalations emanating from privy-vaults and cesspools befoul the atmosphere around them to such a degree as to produce sickness and death. The privy

vault often becomes a much more dangerous enemy to human life than a powder magazine, a nitro-glycerine or a dynamite factory, yet the latter are required by law to be located far from human habitation, while the former is tolerated in close proximity to human dwellings, often under the same roof with human beings. * * *

A settler in a new country generally digs two holes in the ground after erecting his humble dwelling. Into one goes all the filth and offal; out of the other comes all the water for family use. These holes are usually so near together that their contents mingle, so that what goes into one comes out of the other. In an old-settled country the wells and pumps are generally public property, but on account of convenience and want of legal protection, they are closely surrounded by privy-vaults and cesspools, and as some of the water from the well is returned to the holes for the reception of filth, a large share of it may find its way into the well—a very economical arrangement when the water-supply is short, but not to be recommended if we value our health. In the city of Baltimore, about thirty years ago, there stood a tavern, or a saloon, at the corner of what are now two prominent and well-known streets. About fifteen or twenty feet from the saloon there was a public pump. One night, from some cause, all the whiskey in a barrel lying in the cellar of the saloon leaked out, and but little of it was seen in the cellar; but for nearly a week after there was little whiskey sold in the saloon, because its patrons found out in some way that they could get their whiskey and water already mixed, and free of cost, out of the pump at the corner. How did the whiskey get into the well? By percolation, in the same way that the foul liquid from the privy-vaults and cesspools reaches our wells and springs. Of this fact there is abundant proof from all the best and most undeniable authorities. Dr. H. F. Lyster, of Detroit, in a paper read before Ionia Sanitary Convention of 1883, related how an outbreak of typhoid fever occurred in Adrian in September, when twenty-five school children sickened, several of whom died. The cause was found to be a well close to several privy-vaults and cesspools which had been in use for twenty-five or thirty years. The fecal discharges from the first child taken with the disease was thrown in a receptacle which actually connected with the well, wherefrom the other children who drank the water came down with the disease. A mild extensive epidemic of typhoid fever occurred in Neuchâtel, Switzerland, in the fall of 1882. There were six hundred and twenty-three cases between September 14 and October 20. The total cases included 5 per cent. of the entire population. All classes were taken. The water-drinkers suffered most, and, so far as reported, those who drank only beer escaped. The typhoid outbreak in Syracuse, N. Y., 1879, upon investigation, was proven to have been caused by the overflow of a privy polluting the water. People living in the same block and under similar conditions, except as to the water they drink, escaped entirely. The typhoid outbreak among the German troops in 1882 was proven, by a very searching investigation, to have occurred from the same cause. Whenever it is possible, privy-vaults and cesspools should be dispensed with entirely. But as there may be cases where their use cannot be dispensed with, they should be built of such material and in such a manner as not to allow any of their foul contents to escape, and they should be so thoroughly disinfected as to prevent putrefaction during the intervals of removal of their contents, which should be done frequently. I can think of nothing more disgusting to sight and smell, more nauseating to the stomach, or more dangerous to health than the ordinary country privy, with a quivering mound of excrement under each seat. Often they can be seen endeavoring to hide in shame behind the grapevines, the evergreen, or the creeping vine. In small towns and country places there should be no such thing under the seat as a privy-vault (except where a water-closet is used, then it should be constructed as above described), but there should be a strongly made galvanized-iron box, into which everything would fall. I prefer galvanized-iron to wood, as it cannot become saturated with the foul liquids, and is easier cleaned. The back or side of the building should be so constructed that this box could be easily removed and emptied, and another put in place. When the box is put in position, the bottom of it should be covered with dry earth or ashes to the depth of four inches. When this simple and inexpensive arrangement is made, it only requires a little dry earth or ashes sprinkled daily over the contents of the box, but it would be still better to throw a little on whenever it is used. In order to do this, there should be a box of dry earth or ashes in one corner of the privy, with a small shovel with which to throw it in. It may be some trouble to do this, but it will be amply repaid by the increase in value of the contents of the box as a fertilizer for farm or garden use, and might be made a source of revenue instead of expense. The discharges from persons suffering from typhoid or such diseases I would advise to be burned, as I believe it to be the only method that can be adopted to destroy the germs of those diseases.

"EXTRAS" IN PLUMBING-WORK.

PRESENTED BY THE MASTER PLUMBERS' ASSOCIATION OF CHICAGO, ILL.

EXTRA work on plumbing, as on all other contracts in the building line, is an important and profitable study for the consideration of plumber, architect, and owner, and in response to the request of the National Association, Chicago master plumbers herein undertake to solve the problem, believing that what they lack in age will be well sup-

plied in the experience they have gained in plumbing \$112,000,000 worth of business and residence buildings in nine years. In this enormous amount of building in this very short period we have, on the best authority, the cost of plumbing to have been \$2,500,000. On this amount of contract work there has been, according to the same authority, \$625,000 of extra work, 25 per cent. of which has been disputed and never paid; or, in other words, there is due the Chicago master plumbers by the property-owners of Chicago \$156,000. Can we wonder, then, in view of these facts, that 75 per cent. of the master plumbers of the country are living in rented homes? Can we be surprised that the victim sometimes turns on his tormentor and that skin plumbing is the result? * * * Our first question is, Can plans and specifications be so drawn as to avoid extra work? We hold they cannot, for the following reasons: The architect in planning a house is governed by the wants, tastes, whims, prejudices, and finances of his client, and, being a stranger to all these with the exception of the latter, he, indeed, must needs be a judge of human nature who could, upon such short acquaintance as he is usually afforded, meet every want. His client wishes to have every conceivable ornament and accommodation in that prospective home that months of thinking and planning can suggest, together with all the recommendations of his friends, and not being able to judge intelligently from plans how this or that arrangement will suit his peculiar ideas, it is only as the work progresses, and he sees it as it will be, that he can say with any degree of certainty what shall be. The speculative builder never has any extras on his contracts. He is quite content to leave the extras for the next owner. But for him who builds a residence for himself and family, or a fine office or business block, to avoid changes in the original plans and specifications is to be dissatisfied in the end. It is only as that building or home which has been the ambition and dreams of years grows to its completion that this or that arrangement suggests itself. Another cause of extra work is the suggestions of the conscientious plumber, who, I believe, is the proper and only capable adviser in such matters. The benefits to be derived from the advice of the honorable, honest, capable, and observant plumber are incalculable. His experience among all classes, and the shades of opinion, the criticisms he hears of this or that kind of work or arrangement of fixtures, enable him with his practical knowledge and experience to know what is best, according to the conditions and circumstances he is confronted with. The average master plumber executes the plumbing of as many houses in a few years as the architect plans and builds during his professional life, and yet the former is, if not treated with contempt, silently ignored, resulting in one of two things—extra or poor work. The master plumber, true to his professional honesty, chooses, with the owner's or architect's permission, the former, very often knowingly running a risk of never getting paid for his labor and pains. The owner builds one house in a lifetime, and during its contemplation is fully determined that the building which is to house and home himself and family during his remaining years is to have, at least, good plumbing. He comes to the conclusion during the planning and discussion of the plumbing with his architect that he is quite an expert, and that between the two that important feature of his residence which formerly gave him so much anxiety will be properly cared for. Thus the work is planned for that house where every comfort is desired, and the fixtures selected which are to make life miserable or happy, with the inevitable result again—poor or extra work. Another cause of extra work is the rapid strides we are making in improvements and inventions. It is not a very rare occurrence to see between the time the house is planned and ready for finishing that the Patent Office has issued letters patent for half a dozen "simple, sanitary, scientific closets," each one of which is "the very best on earth"; therefore, it is just the thing for the ambitious architect or owner, who, disregarding the old proverb, is anxious to be the first by whom the new is tried. Our next consideration is, who should write the specifications? Not the plumber, as by so doing we reverse the order of things to the detriment of architect and contractor, the former losing prestige and influence in having them executed, and the latter, while individually benefited, has an advantage over his fellows which should not exist in competitive work, where all should have an equal and fair opportunity. Therefore, I would consider the writing of specifications outside the province of the contractor. The great difficulty with specifications, as they are written at present by the great majority of architects, is that they are too general, and, while often losing themselves in details, which is a reflection on even ordinary intelligence, and which should be left to the contractor's judgment, the architect loses sight of general principles, or the system which should, I respectfully submit, be his chief consideration. * * * To whom, then, are we to look for those ideal specifications for which the honest and skillful plumber looks in vain, which will place all contractors on an equality, which will leave no loophole for the trimmer, which will reduce extra work to the minimum and guarantee the architect and owner the class of work they desire? To accomplish these objects, I would recommend that master plumbers' associations throughout the country draw up and adopt specifications suitable to their locations, and embracing the facts and principles accepted at the present time by our best authorities on good plumbing, leaving blank for the architect to fill in the kind and quality of fixtures. * * * This I consider the first duty of master plumbers' associations. I believe specifications prepared and formulated by such authority will be accepted by architects, boards of health, and the public in general as the beginning of a new era in plumbing, in which all

concerned in that important branch of building will feel more at ease, and the plumber will acquire that importance and consideration to which his profession entitles him, and we will have made one step in the direction of lessening extra work. Our next, last, and most serious consideration is, how best to collect just charges for extra work. What constitutes extra work is well defined by law, but as our concern is chiefly how best to avoid that troublesome and tedious process, we would recommend what seems to us the only possible way out of this difficulty and annoyance which every contractor, more or less, experiences. First, then, it must be settled beyond dispute between the superintendent and the contractor, before work is done, what shall be extra work. This can be best accomplished by insisting on having written orders for such work, these orders being blanks prepared by master plumbers' associations, and furnished by the contractor, to be filled out by the architect or the owner when ordering work considered by the plumber to be outside his contract. * * * Next, we would recommend the preparation of a price-list annually, or oftener if thought necessary, by the same authority (master plumbers' associations), to govern extra work, which, being a uniform, fair, and regular price, and emanating from such a source, would entitle it to a respect at the present time seldom accorded a plumber's bill, and would put it beyond the possibility of successful dispute. Next, we would recommend that bills for extra work be carefully itemized, and rendered when work is done and before it is covered up, affording the superintendent an opportunity of measuring and checking off, and thereby removing the last obstacle in amicably and satisfactorily adjusting extra work, its price and its payment.

THE EDUCATIONAL QUALIFICATIONS OF THE MASTER PLUMBER.

BY THE MASTER PLUMBERS' ASSOCIATION OF COLUMBUS, O.

TIME was when plumbing advancement received the attention of the ambitious few; now, many circumstances make it an imperative duty for every master plumber to board the car of progress. Plumbing has been lifted from the ditch of dirty labor by the hand of science and made the peer of ingenious art. The medical profession and the grand army of sanitarians, health boards, and popular intelligence are urging upon the plumber the recognition of his important position as a practical sanitarian. They insist upon his ability and courage to meet the responsibilities of his office. Science is pouring a flood-light of truth upon the subject. People are becoming interested in house-drainage. They recognize its importance and demand of the plumber that he be in fact as well as in name a master plumber. The pressure for sanitary work is becoming so great that our craft has but one line of policy to follow, and that is to meet the demand of the times. * * * It has become a recognized fact, that he who owns a shop, takes contracts, and employs journeymen, is not necessarily a master plumber unless he does indeed master his calling, and is able, by means of native and acquired ability, to solve the many problems that cluster around sanitary plumbing. The master plumber is not one to be lashed by public opinion and health boards into a recognition of his sanitary relation to the homes intrusted to his skill; but he is the man first to observe that relation, causing sanitary authority to respect and protect it. The qualifications of a master plumber should partake of both general information and technical education. The same rule of intelligent conduct that governs and develops success in other pursuits applies with equal force to plumbing. The demands made upon our craft for brain-work are implied in the appellation, "master," and made imperative by the very nature of our labor, touching the health and happiness of the people. The responsibility of the master plumber implies and depends upon intellectual attainments. It is evident that if he is to meet these requisitions with fairness and honesty he must possess the finish of education and study. The advantage gained by scholastic training is not so much the retained facts of science and philosophy as the mental discipline and the powers of concentration and application which are accorded the student. The secret of success is the power to think and reason. Mental training is a means of developing this power. The advantages of general education will not be called in question. * * * The master plumber of general education and information is more able to reduce the ideal to practice, and to force the recognition of sanitary plumbing upon the attention of city authorities. His opinions on questions of house-drainage, sewerage, water-supply, etc., will secure the consideration accorded superior judgment. Educated brains are just as necessary to the master plumber as to masters in other callings. The standard of plumbing is much higher now than ever before, and the qualifications of the master plumber is being pushed far along the line of general education. Success in purely manual labor may not depend upon any degree of scholastic preparation, but just in proportion as the work becomes special or technical to that degree do special study and preparatory education become necessary. The master plumber should be versed in physical philosophy, especially in the laws of hydrostatics, pneumatics, and chemistry. He must be able to make mechanical drawings and specifications. He must know the relation of heating to ventilation and be able to establish both upon correct principles. He should be a connoisseur of the many plumbing devices and fixtures that are crowded upon his attention, in order to secure the greatest economy consistent with utility and sanitary effect. He must be able to advise with owner, contractor, and architect in adopting the best means of house-drainage under all possible variations of circumstances. He should

comprehend the vexed subject of city sewerage and know how to drain the subsoil and surface. * * * At the meeting of this association a year ago, we advocated the establishment of technical schools ample to accommodate all young plumbers. Our present schools and lecture courses, established in some of the larger cities, are paving the way to the accomplishment of this end. The necessity for securing technical education is fast securing merited attention. The outlook is encouraging. Technical qualification, however acquired, is the question of the hour whose importance is urged upon the craft by every circumstance looking toward its future welfare. Without technical knowledge the plumber is no longer able to fill his mission, and his services, instead, in the light of progress, are rendered not only useless, but harmful—even criminal. Though plumbing schools are of great advantage, they are not indispensable to the acquirement of technical knowledge. Any one of ordinary mental capacity may attain general information and special education. If he is seriously interested in his work he will find abundant aid in plumbing literature. With a small outlay he can secure plumbing books and journals, works on house-drainage, architecture, sanitary, and every other branch of science allied to modern plumbing, which they teach in detail and illustrate in order to convey the essential points clearly and distinctly. The ends of modern plumbing must be served either by qualification or legislation. We must exact special preparation and fitness on the part of candidates for entrance to the plumbing fraternity. If technical school education is not afforded these men, let them be self-educated. Subscribe for a half-dozen journals and books upon sanitary plumbing and kindred subjects. Do not only fill your libraries with this literature, but fill your minds with the thoughts of the authors. Let all knights of our craft meet this subject with fairness. Let apprentices, journeymen, and the masters meet upon one common level in matters of special qualification. Technical knowledge is not a garb of empty show, but it is practical talent. It is required to comprehend the principles of sanitary plumbing. It is required in order to discard insanitary arrangements and to tear down errors in house-drainage. It is necessary in order to teach and enforce skilled labor. It is necessary in order to secure our rights with the architect and owner. Technical knowledge precedes all plumbing legislation, and insures the sympathy and co-operation of the public. The day of scamp-work and skin-plumbing is about to close. The State may not interfere with personal liberty, nor should it attempt to enforce a standard of qualification for the plumber; but for the good of her subjects, it may discriminate between sanitary and insanitary plumbing, and so legislate as to punish the offenders against sanitary law. Plumbers who are floundering among the principles and practices of our forefathers and will not yield to the spirit of progress and sanitary improvement must be stamped with the seal of condemnation. If they will not qualify, then let them receive the disapproval of master plumbers and suffer the penalty of violated law. This association (National Association), being the only representative organization of the master plumbers of the United States, should adopt rules and regulations to govern subordinate societies in the matter of qualified membership. There should be a standard of qualification to which all local societies should conform. Members should be admitted by a board of censors after a thorough examination and satisfactory evidence of qualification. Such a ruling would give worth and dignity to membership. Men who would not or could not qualify for membership would be properly estimated by the public.

Gas and Electricity.

Illuminating Power of Gas in New York City.

Week ending	New York Gas-Light Company.	Manhattan Gas-Light Company.	Metropolitan Gas-Light Company.	Mutual Gas-Light Company.	Municipal Gas-Light Company.	Knickerbocker Gas-Light Company.	Equitable Gas-Light Company.
July 17....	27.06	21.75	20.81	20.67	30.34	22.65	32.96

E. G. LOVE, Ph.D., Gas Examiner.

THE TESTS OF THE CITY GAS EXAMINER.

THE President of the New York Gas Consumers' Association has undertaken to enlighten a *Tribune* reporter on the meaning of certain figures which he finds in the weekly report of the Gas Examiner, as published in the *City Record*. Unfortunately, this champion of the gas consumer shows such a lack of information on the subject that we are inclined to think he might just as well have left the matter to the imagination of the reporter. He notices that the tests for illuminating power are taken in the day-time, and he asks: "Why don't he (the examiner) take the measure at eight or nine o'clock, when all the theatres are going, and the lights all over the city are at full blast?" As a matter of fact, it makes no difference in photometrical tests what the street-pressure is, so long as it is sufficient to supply the necessary amount of gas. Photometers are provided with delicate governors which reduce any excessive pressure

and also keep it uniform, and whether the pressure in the main was one inch or four inches, would not affect the result, inasmuch as the governor would control it. A test at eight or nine o'clock in the evening would, therefore, show no different result in consequence of additional pressure in the main than one taken in the day-time.

The reporter's attention is called to another "curious thing." The examiner's reports have one column in which is given the pressure of the gas as "delivered to the burner," and it was noticed that the pressure so recorded was not always the same. The pressure given in this column is taken at the lower end of the burner pillar or tube, on the upper end of which the burner is placed, and is taken when the gas is burning. The gas has already passed through two governors besides the test-meter of the photometer, and, consequently, the pressures in the column referred to give no idea of what the pressure in the street-main may be.

In testing for illuminating power the gas is burned at the rate of five cubic feet per hour. To secure this rate of consumption the Gas Examiner makes the necessary adjustment by means of a governor instead of by a micrometer-cock as is usually done. Hence, the pressure required to pass five feet of gas through any particular burner will often give some idea of the character of the gas being tested. If, for instance, a gas of twenty candles should be increased to twenty-five or thirty candles by the introduction of more of the heavy gases called "illuminants," and other things remained the same, the specific gravity would be increased, and a greater pressure would be required to pass the same quantity of the higher candle-power gas through the given burner. As no illuminating-gas is made of an absolutely uniform composition, and as there is always more or less variation in its specific gravity, it follows that the pressure required to pass a given quantity through a given opening in a given time will also vary.

Moreover, minute particles of carbon will often adhere to the sides of the burner-opening, which, after some time, becomes slightly smaller, and a little more pressure is needed to pass the five cubic feet required. These carbon deposits are extremely hard, and it is quite impossible to remove them entirely. For this reason a new burner requires less pressure to pass a given quantity of gas than an old one in which this carbon has accumulated.

The burner used in testing the city gas contains a check, as is the case with the most common burners, and by removing this check the pressure of the gas as "delivered to the burner" would be lower in consequence, even though the pressure in the street-main might be increased.

In the *Tribune* article the greatest variation mentioned in the pressure as "delivered to the burner" was .08 of an inch in the case of one company, and 0.11 of an inch in that of another, between February and June. (The reporter made a mistake in his decimal point, getting it .104 instead of 1.04, etc.) When it is remembered that the smallest divisions on the ordinary pressure-gauge indicate 0.1 of an inch, the variations mentioned above, even if they applied to the pressure in the street-main, which is not the case, would not indicate anything. Unless the companies could do better in the way of increasing their pressure than the above figures show—viz., 0.1 of an inch in four months—it would hardly be worth while for them to attempt it.

To repeat what has already been said, the Gas Examiner's weekly reports, which were taken as a basis for the statements and surmises as to street-pressure, give no information whatever on this point, and they are not intended to. At the two testing-stations there are pressure-registers which give the pressure on the mains of the different companies at those points for every hour of the twenty-four. As this is a matter of some interest and much speculation just now, we refer to it again elsewhere.

GAS-PRESSURES IN NEW YORK CITY.

AS MUCH has been said recently about the pressure of the gas supplied by the different companies of this city, we give below the average maximum and minimum pressures, during lighting hours, for the quarter ending June 30, 1886, and also the pressures for the corresponding quarter in 1885, 1884, and 1883. These figures are from the reports of the Gas Examiner, and are the height in inches of a column of water which the pressure of the gas supports. Those of the Metropolitan and Knickerbocker Companies were taken in East Seventy-Ninth Street, while those of the other companies were taken at the Photometrical Station in Grand Street. At both of these stations the

pressures are taken by self-registering gauges. "Lighting Hours" represent the time during which the public lamps are kept lighted:

COMPANY.		1886	1885	1884	1883
New York.....	{ Max..... Min.....	1.06 0.98	1.32 1.28	1.09 1.02	1.54 1.47
Manhattan.....	{ Max..... Min.....	2.09 1.00	2.37 1.33	2.12 1.02	2.74 1.35
Metropolitan.....	{ Max..... Min.....	1.53 0.82	1.62 0.92	1.67 0.90	1.80 0.94
Mutual.....	{ Max..... Min.....	2.41 1.65	2.54 2.08	2.48 1.82	2.67 1.98
Municipal.....	{ Max..... Min.....	2.17 1.29	2.30 1.46	1.92 1.17	2.40 0.91
Knickerbocker.....	{ Max..... Min.....	2.90 1.32	3.50 1.46	....	....
Equitable.....	{ Max..... Min.....	1.99 1.31	2.10 1.52	....	....

THE following figures concerning the illuminating-gases of this city are abstracted for THE SANITARY ENGINEER from the report of the Gas Examiner for the quarter ending June 30, 1886:

	New York Gas-Light Company.	Manhattan Gas-Light Company.	Metropolitan Gas-Light Company.	Mutual Gas-Light Company.	Municipal Gas-Light Company.	Knickerbocker Gas-Light Company.	Equitable Gas-Light Company.
Average Illuminating-power for the quarter.....	26.18	19.53	22.04	30.13	29.73	24.78	31.60
Sulphur, grs. in 100 cubic feet.....	4.61	9.67	21.29	4.42	5.37	3.48	2.76
Ammonia, grs. in 100 cubic feet.....	0.64	8.01	6.07	0.37	0.71	0.91	0.25
Specific gravity.....	.623	.483	.568	.753	.655	.629	.671

A WELL of natural-gas has been struck at Knowersville, in Albany County, N. Y.

MAIN STREET, in Pawtucket, R. I., was shaken up on July 17 by a series of explosions in close succession in the sewer. In all about 250 feet of street was torn up.

WHILE a night gang of laborers on the new Croton Aqueduct were descending a shaft in a bucket, last Friday evening, a gasoline-lamp carried by one of the men exploded. Two other lamps were exploded by the first, and the bucket filled with flames. Four of the five men jumped out and fell to the bottom of the shaft; the fifth clung to the air-hose at the side of the shaft. All were badly burned.

PROFESSOR WILLIAM RIPLEY NICHOLS.

THE death was reported, by cable from Hamburg, on Saturday, of William Ripley Nichols, Professor of Chemistry in the Massachusetts Institute of Technology. To readers of THE SANITARY ENGINEER Professor Nichols has been well-known by his papers on water-supply and kindred subjects. He had a high reputation on both sides of the Atlantic.

We hope to make more extended notice of his work hereafter.

THE Belmont School, on Westminster Avenue, in Philadelphia, has been in very bad sanitary condition—to such a degree that the teachers have declared that fifty per cent. of the pupils have suffered from throat diseases induced by the condition of the school building, and the health of many of the teachers has been seriously affected. The building was once before closed because of its bad drainage, which it was supposed had been remedied.

WATERFORD, in Racine County, Wis., is suffering from an epidemic of typhoid fever, and the State Board of Health has been asked to make an investigation.

Association News.

THE STEAM-FITTERS' STRIKE IN CHICAGO—FORMATION OF A MASTERS' ASSOCIATION.

UNDER date of July 16 a correspondent writes to us from Chicago that the steam-fitters' strike has ended. After staying out nine weeks the men applied for work at the old scale of wages and on the basis of ten working hours to a day, but only a part of the strikers can be taken back, as their places have been filled with new men. The demand, to enforce which the strike was made, was that eight hours should constitute a day, and that wages should be so adjusted that all workmen before receiving \$3 or more per day should be reduced under the new scale ten per cent.; all men receiving less than \$3 per day should not be reduced. Our correspondent points out that the effect would have been to reduce the wages of the \$3 men to five cents per day less than the wages of the \$2.75 men.

The strike led to the organization of the Master Steam-Fitters' Association of Chicago, which was incorporated June 17, and is claimed to include all the leading firms in the city. The second article of their by-laws declares the purpose of the association to be "mutual protection against strikes, dishonest or intemperate workmen, and to cultivate acquaintance with each other." Its officers are a President, Vice-President, Secretary and Treasurer, and its business affairs are in the hands of a board of three trustees. This board, it would seem, is also to act as a board of arbitration in case of disputes between members or between a member and his employees, and should a trustee be a party in the dispute to be adjusted, then a trustee, *pro tem.*, is appointed in his place during the pendency of the matter.

In case of a strike or general demand of employees for a change of hours or pay, the matter is to be referred to the trustees, and if they are unable to adjust it then the association is empowered, on a two-thirds vote, to order a lock-out until the matter is settled.

The annual meeting of the association is appointed for the last Tuesday in March.

PHILADELPHIA ENGINEERS' CLUB.—The club met June 19, President Washington Jones in the chair, and 21 members present. The tellers of election reported that 101 votes had been cast and that the following had been elected members of the club: *Active*—Messrs. J. S. Walker, Hiram J. Slifer, Richard B. Osborne, G. L. Jones, George Henderson, and B. H. Wright; *Associate*—Mr. E. V. Douglass. The secretary presented a report from the Publication Committee, to whom was referred the matter of providing additional facilities for the discussion of papers, wherein the committee recommend no departure from the present methods. On motion, the report and recommendations were adopted. The secretary presented, for Prof. L. M. Haupt, the following: "Whereas, It is proposed in the U. S. Senate to add an item to the River and Harbor Bill amounting to one million dollars, for the purpose of beginning the work of improving the entrance to New York Harbor, in accordance with the specific plan approved by a Board of Engineers as stated in Ex. Doc. No. 78, House of Representatives, 48th Congress, 2d Session; and, whereas, the plan as proposed involves a large expenditure of time and money, and is uncertain in its results; and, whereas, we believe the limitation of the expenditure to a specific plan would not produce the desired end in the most expeditious manner; it is therefore *Resolved*, that in view of the great importance of radically improving the entrance to the harbor of New York, in the most expeditious, economical, and effective manner, we would respectfully request our honorable Senators and Representatives in Congress to urge the appropriation of the amount desired, but only on the condition that its application be not restricted to any special plan, but be opened to all competitors, upon plans to be subject to the approval of the Chief of Engineers, or of a board of engineers to be appointed by him." With reference to the motion to adopt the resolution, Professor Haupt called attention to the uncertainty, expense, and great length of time which would be required to carry out the plan of the stone dyke from Coney Island, and stated that he believed the result would be merely to create a second contraction, similar to that existing at the "Narrows," with deep water at the exit, but that beyond there would reform a bar with not more than the present depth of water. The plan of tidal scour is limited at that locality to twenty-four feet, and unless some device be used to maintain an increased bottom

velocity at ebb tide he predicted failure. The dyke would violate a fundamental principle of harbor construction, by opposing great resistance to the flood wave, and hence diminish and weaken the ebb discharge, causing a shoaling in the lower bay and a cutting off and destruction of the northern channels. It would also render existing "aids to navigation" (light-houses, etc.) useless. He reaffirmed his opinion as to the practicability of utilizing the forces, acting so powerfully at the head of Gedney's Channel, to open and maintain the same, and believed it should be attempted by other means than by dykes or by dredging before Congress committed itself to the plans proposed. On motion of Mr. E. S. Hutchinson the preamble and resolutions were unanimously adopted. The secretary presented for Mr. H. K. Lee a table of sizes of chimneys for the reference-book. The secretary presented for Mr. Fred. Brooks, C. E., of Boston, a table of approximate metric equivalents for the reference-book. The secretary presented a letter from Capt. Spencer C. McCorkle, wherein he states that the Superintendent of the U. S. C. and G. Survey had given his assent to the presentation to the club, for publication and discussion, of the investigation which Capt. McCorkle has made of movement of ice in the Delaware River in 1886. Capt. McCorkle was present and explained the scope of the paper and specially desires free and full discussion thereof. Mr. Gratz Mordecai, author of a report on railroad terminal facilities at New York, presented "Notes on the Investigation of the Movement of Freight and Passengers in Cities," and exhibited a large map—about 6'x10'—showing New York City and surroundings from Eighty-sixth Street on the north to Erie Basin on the south. The club adjourned for the summer, to meet at the call of the chair.

OHIO ARCHITECTS.—(Cincinnati, July 17.)—The first semi-annual meeting of the Association of Ohio Architects was held in this city, Thursday and yesterday. There were present Messrs. Charles Crapsey, Oliver C. Smith, George W. Rapp, Edwin Anderson, James W. McLaughlin, W. R. Forbush, W. Martin Aiken, W. S. Des Jardins, Theodore Richter, D. S. Shuermann, H. E. Siter, George W. Drach, M. Rumbaugh, and A. W. Hayward, of Cincinnati; J. W. Yost, Columbus; F. O. Weary, Akron, O.; Guy Tilden, Canton; Max Rouetti, Hamilton; Charles B. Cook, Chillicothe; H. A. Linthwaite, Columbus; Luther Peters and S. K. Burns, Dayton. The new members elected were: George H. Martzel, Columbus; T. C. Bate, Cleveland; Peters & Burns, Dayton; Herman Kling, Youngstown; F. K. Hewitt, Tiffin; and Max Rouetti, Hamilton, D. S. Shuermann, S. E. Des Jardins, M. Rumbaugh, W. Martin Aiken, E. Budde-meyer, A. W. Hayward, W. W. Franklin, and Theodore Richter, of this city. The code of rules as recommended by the Western Association of Architects was adopted. A communication from the Plasterers' Union asking the association to "boycott" certain boss plasterers who employ non-union men, by refusing to let them bid upon jobs, was incontinently laid on the table. President Rapp, in the course of his address, said: "An association of this kind aids materially in cultivating the taste of the people in the sublime art of architecture, by the artistic as well as practical productions of its members, and the upholding of a reasonable schedule of charges, as now established by the several State associations of Illinois, Iowa, Missouri, Kansas, Florida, Minnesota, and Texas. The formation of State associations has become a necessity, for only a State association can look after the local welfare of the profession, the proper modification of existing building laws, and the proper revision of proposed new laws. This association should adopt and enforce proper codes for competitions, governing ourselves as well as building committees or commissioners having charge of proposed buildings."

NEW YORK MASTER PLUMBERS.—The Committee of the Association on the demands of the journeymen, embodied in Reference Card No. 1, have prepared a reply substituting what the masters will consent to, which has been sent to the journeymen's committee. An answer was received a few days ago saying that the journeymen would take action on them at the earliest date possible. The Masters' Association will meet to-morrow evening.

PERSONAL.

COMMANDER W. T. SAMPSON, U.S.N., has been appointed by Secretary Whitney to be Superintendent of the Naval Academy at Annapolis, succeeding Captain F. M. Ram-

sey, who, it is believed, will be appointed to the command of one of the new cruisers.

CLEVELAND, O., BUILDING EXHIBITION.—The project to form a permanent exhibition of building materials and improvements has progressed so far that a lease of a building for the purpose on Superior Street has been drawn up. The managers of the enterprise are: W. H. Doan, President; F. H. Houghton, Secretary and Treasurer; and W. H. Kennedy, Manager. It is intended to have the exhibit comprise everything which enters into the construction of a building—granite, sand-stone, bricks, tile, slate, all kinds of lumber and finishings, builders' hardware, mantels, grates, ranges, stoves for coal, gas, or wood, window-glass and stained or cathedral glass, sash, doors, and blinds—in fact, everything which enters into the construction of a building will be given a place in the exhibit. It is proposed to throw the building open to the public August 1. The enterprise will be known as the American Permanent Exhibit and Exchange of Building Material and Improvements.

WE are requested to state that the Free Public Library at the British Patent Office, 25 Southampton Buildings, Chancery Lane, London, will, on and after July 1, 1886, be open to the public daily from 10 A. M. to 10 P. M., instead of, as heretofore, from 10 A. M. to 4 P. M. This library, in addition to the specifications, indexes, and other publications of the Patent Office, contains a large collection of the leading British and foreign scientific journals, transactions of learned societies, and textbooks in the various departments of science and art.

Notes.

For works for which proposals are requested, see also the "Proposal Column," pages 173 and 174

CONSTRUCTION.

PUMPING-ENGINES.—The Boston, Mass., Water Board wants two duplex water-works pumps, with foundations, boilers, and fittings complete; each pump to have a capacity of 200 gallons per minute, with a piston speed not exceeding 100 feet per minute. Address H. T. Rockwell, Chairman of the Board, at the City Hall, until July 27.

WATER-WORKS WANTED.—See our "Proposal Column" for proposals on the construction of water-works for Martin's Ferry, O. George Hornung, Constructing Engineer.

PUMPING-ENGINES.—The Common Council of Milwaukee last week passed the following resolution: "That the City Engineer be and is hereby directed to make general specifications for a pumping-engine and necessary boilers capable of pumping 6,000,000 gallons of water every twenty-four hours, the same to be erected at the new high-service station, corner of Tenth Street and North Avenue, and further, that the Board of Public Works be and is hereby authorized to contract pursuant to law for such pumping-engine and necessary boilers."

CLEVELAND, O.—Proposals have been advertised for by City Engineer C. G. Force, of Cleveland, O., for the construction of an iron bridge and sewers.

BROCKTON, MASS.—At a meeting of the Sewerage Committee, July 13, Mayor Whipple presiding, Mr. P. Ball, of Worcester, was chosen engineer to carry out a system of sewerage. A working committee to act with the Mayor was appointed as follows: W. F. Cleveland, E. L. Brown, C. W. Tilton, and C. C. Bixby.

MALDEN, MASS.—Just now a very active discussion is going on over the ways and means of providing additional water-supply for the elevated parts of the city. The citizens of these districts have presented a petition to the Mayor and Council, and have employed Mr. Henry Baylies as counsel to press their demands. Apparently they want a driven-well service, which does not find much favor with the Water Board. The Mayor is Mr. Coggan; the Chairman of the Water Board is W. A. Wilde.

CAMDEN, ONEIDA COUNTY, N. Y., will build water-works. Contracts have been let. H. G. Du Bois, Secretary of Board of Water Commissioners, can give information.

MILWAUKEE, WIS.—It is said the project of building a tunnel from the Lake to the Milwaukee River, to convey water for flushing the river, will be revived. President Baumgarten,

of the Common Council, has given notice that he will introduce a resolution in that body asking the State Legislature to grant authority to issue \$200,000 of bonds for the undertaking.

GALENA, ILL.—Water-works will be built here by the National Tube-Works, of McKeesport, Pa. The cost will be about \$50,000. Harry S. Raymond, of Galena, represents the company.

GREEN BAY, WIS.—The election, July 15, on the question of water-works resulted in a large majority in favor of constructing them. They will be built by the New England Construction Company. The estimated cost is \$200,000. The company will put in 125 to 170 fire-hydrants at an annual cost to the city of \$6,000.

ALTOONA, PA.—Additional water-supply will be obtained. The Water Commissioners have arranged with C. W. Knight, hydraulic engineer, of Rome, N. Y., to report on the subject. J. P. Levan, of the Water Commission, will give information.

READING, PA.—An ordinance providing for the appropriation of \$110,000 for sewers is before the City Council.

AUSTIN, TEX., votes on the question of appropriating \$25,000 to the construction of sewers.

AURORA, IND., about twenty-five miles below Cincinnati, has in contemplation the building of levees to protect the city from high water in the Ohio River. The City Surveyor estimates the cost of levees of one height at \$45,000, and of another at \$100,000.

MILWAUKEE, WIS.—Our correspondent writes: "Dozens of plans have been discussed recently in regard to a way of cleansing the Milwaukee River. Some favor a dam with flush-gates; others, a tunnel from the river to the lake on Dane Place. Some think that the intercepting sewers should be built at once, as per the plans formed in 1879. The intercepting sewer on the south side is claimed to be a failure, but the City Engineer says, in regard to the complaints, that when the Park Street extension is completed, the sewer will be a success and will do the work it is intended to fulfill satisfactorily."

THE Monongahela City Water Company, of Monongahela City, Pa., has been organized. Capital stock, \$15,000. Treasurer, James McCullough.

NEW YORK CITY.—The New York Arcade Railway has appointed Chester A. Arthur, Cornelius N. Bliss, John O'Brien, W. H. Wickham, Thomas Cecil, and Melville C. Smith a committee to report upon plans of construction.

CHATTANOOGA, TENN.—Col. Barlow, in charge of the work on Muscle Shoals, has made a report to the Engineering Department at Washington regarding the overflows of the Tennessee River at this point, with suggestions of the most practical remedies. The report was rendered in a reply to a request of the Board of Trade of this city, and has been forwarded, through Congressman Neal, to the Secretary of War. Col. Barlow states that he suggested that an extended system of levees would be, perhaps, the most feasible and economic plan. He estimated the cost roughly at \$250,000.

MILWAUKEE, WIS.—Bids for constructing and fitting-up the high school building on Knapp and Cass Streets were opened by the Board of Public Works, July 13, as below: For the building, G. F. Stuewe, \$56,300; Anton Mauk, \$57,538; Charles Kraatz, \$51,643; John Kraatz, \$53,381; J. H. McGovern and N. Jansen, \$54,840; Oscar Knie, \$63,000; P. Drew, \$57,600; Herr & Mueller, \$54,990; Arthur H. Vogel, \$51,280; John Fellenz, \$57,885; Joseph H. Lenicheck, \$54,225. The bids for the steam-heating were as follows: M. Coogan, \$7,740; Charles A. Barker, \$7,625; H. Moers, \$7,690. William Eagan offered to do the necessary plumbing and gas-fitting for \$2,171. Contracts had not been awarded at the time of going to press.

TRENTON, N. J.—Bids for rebuilding the State Capitol were opened by the Capitol Rebuilding Committee, July 13, as follows: Messrs. Fordyce & Himpler, East Newark, erect complete for \$264,800; H. G. Spur, Warren Street, Newark, Indiana stone, \$173,000; Euclid stone, \$180,000; Belleville brown stone, \$207,424; Cubberley & Kafer, Trenton, all carpenter-work, including tin and slate roofing, \$34,941; Titus & Conrad, all carpentering work, \$33,900; Henry M. Doremus, Newark, carpenter-work, \$53,700; Elias

Berla, Newark, plumbing, gas-fitting, and sewerage, \$3,800; Post & McCord, 102 Broadway, New York, iron-work, \$65,559; East River Iron-Works, 104 East River, iron-work, \$76,980; Union Iron-Works, of Trenton, all iron-work, \$81,900; James W. Dignan, Trenton, plumbing, steam, and gas fitting, \$6,863.06; George E. Fell, all mason work complete, with materials, including either Indiana or Euclid stone, \$156,990; Thomas Craig, Trenton, plumbing, gas, and steam fitting, \$6,716. F. S. Katzenbach & Co., Trenton, labor and materials for steam-heating, \$3,900; plumbing, \$3,400. Robert S. Johnston, Trenton, mason-work and materials, including Indiana or Salem stone, \$139,000; Bowling Green, Kentucky, stone, \$145,000; Lumberton stone, \$190,000. William Past, Trenton, mason-work and materials as follows: Salem or Indiana stone, \$155,677; Bowling Green, \$163,677; Lumberton granite, \$239,000. Mayer & Son, Newark, mason-work with cut stone, Euclid or Malone, \$102,000; Salem stone, \$116,000; Lumberton granite, \$180,000; William H. Burton, Trenton, material and mason-work, Salem or Euclid stone, \$156,277; Bowling Green, \$164,277; Lumberton, \$239,600. Phoenix Iron-Works, iron-work, \$66,175; Farrell & Co., Philadelphia, vault-doors, \$125 each door; Baker, Smith & Co., New York, steam-heating, \$4,189; Hugh Rooney, Paterson, mason-work, with materials, \$59,000; all iron-work, gas-work, carpenter-work, and plumbing, complete, \$197,000. Hollowell Granite Co., New York, stone-work, \$104,757.16; Gillis & Geoghegan, New York, steam-heating, etc., \$4,000; T. H. Prior & Son, Trenton, mason-work, \$156,277, \$164,277, \$239,600, and \$220,000, according to the quality of stone; Wilson Boiler Co., for plumbing, gas, and steam-fitting, \$6,966.

PHILADELPHIA, PA.—The Gas Trustees have awarded a contract for 5,000 12-foot lengths of 4-inch cast-iron gas-pipe to the McNeal Pipe and Foundry Co., of Burlington, N. J., at 25 cents per lineal foot. The only other bidder was the Gloucester Iron-Works, at 27½ cents per foot. The same body has determined to introduce the Siemens Regenerative Gas-Lamps into the public squares of the city, and have ordered ninety-four to be put up at once.

CHICAGO, ILL.—Bids were opened July 16 for the erection of a steel bridge across the Chicago River at Twelfth Street. The contract was awarded to the Chicago Forge & Blast Company for \$41,150. The work will be commenced at once, and the abutments will be ready for laying the bridge about October.

GOVERNMENT WORK.

PENSACOLA, FLA.—Synopsis of bids for joiner-work, post-office screen, wood flooring, glass, hardware, and painting and polishing, for court-house, post-office, etc., opened July 13, 1886:

Time to Complete.	8 months. 8 months. 6 months. 5 months. 4 days. 8 months.
Deduction for Substitution of Sheet for Plate-Glass.	\$1,000.00 1,150.00 1,000.00 1,850.00 135.13 450.00 2,247.65
Price per square foot for Additional Flooring.	\$0.05 .04½ .12 .16 .24 .17 .04½
Amount.	\$19,993.00 24,448.00 17,300.00 25,712.20 15,609.19 15,400.00 18,123.00
Bidders.	Philip Walsh & Son. James H. Costa. John Moore. A. H. Andrews & Co. Robert Mitchell Furniture Co. S. S. Leonard. John Mitchell.

HARLEM RIVER BRIDGE.—The contract was on July 14 awarded by the Harlem Bridge Commissioners, of this city, to the Passaic, N. J., Rolling Mill Company, and Myles Tierney, of this city, at \$2,055,000.

NEW YORK HARBOR.—The U. S. Senate has passed Miller's bill to prohibit the dumping of any refuse in the harbor of New York, and to provide for the appointment by the President of three army engineers, by the New York Chamber of Commerce of one civilian, and by the Governor of New Jersey of another civilian, to constitute a Commission to have charge of New York harbor, to investigate and report from time to time what improvements are necessary, to see to the enforcement of the laws and to make recommendations for the benefit of commerce.

NEW YORK CITY.—The Park Commissioners advertise for new bids for constructing the addition to the Metropolitan Museum of Art, to be opened August 28.

Patents.

No. 344,038 is a patent for a telescoping hydraulic-elevator, issued to Abraham Fitts, of Worcester, Mass., for the combination, in a hydraulic-elevator with outer and inner telescoping tubes or column-sections, of a foot-projection, a head or stuffing-box casing, having a chamber with offsets, movable annular plates respectively supported on said offsets, a spring of coiled rectangular metal disposed within the chamber and confined between said plates, and the packing-rings confined between the plate and follower.

No. 344,131 is a patent for an automatic gas-regulator, issued to James M. Palmer, of Boston, Mass., having an induction-pipe, an education-pipe, a suitable valve-case, and a valve-seat, and the combination of the following, to wit: a body, a float, and a valve connected with said float and adapted to be operated by the pressure of the gas to regulate or equalize the supply of gas to the burners, said regulator being provided with an opening for the introduction of alcohol, naphtha, or other solvent of coal-tar to cleanse the valve, and with a stop-cock or means for closing said opening.

No. 344,157 is a patent for a water-faucet issued to James F. Bogan, of East Boston, assignor to George E. Marvin, Boston, and William E. Carleton, Charlestown, Mass., for a detachable cock with two packing-rings and a locking device, and a stationary valve-sleeve and movable screw-threaded valve-plug having valve and slit and locking-recesses.

No. 344,203 is a patent for a grate-bar, issued to Charles D. Rogers, of Providence, R. I., assignor to George H. Clarke, of Brooklyn, N. Y., consisting of an apertured top having a circumscribing band or tie, and one or more bars connected with the underside of said top and extending longitudinally therewith, thereby forming a series of air-passages on each side between said band and longitudinal bars.

LATE NEW YORK BUILDINGS.

410-412-414 E 81st st, 3 br flats; cost, each, \$16,000; o, Peter Adams; a, Jordan & Gilly; b, Chas. A. Cowen and H. O'Connor & Co.

114 Madison st, br flat and store; cost, \$19,000; o, John Kehoe; a, Fred. Jenth.

Av A, n w cor 80th st, br flat; cost, \$22,000; o, Francis J. Schnugg; a, H. E. Hillenbrand.

Av A, w s, 26 n 80th st, 3 br flats; cost, each, \$16,000; o, Francis J. Schnugg; a, H. E. Hillenbrand.

93d st, n s, 145 e Madison av, 3 br dwells; cost, each, \$12,000; o, Mathias H. Schneider; a, Herter Bros.

77th st, s w cor 9th av, br flat and store; cost, \$28,000; o, John T. Farley; a, Thom & Wilson.

125th st, s s, 260 w 5th av, 5 br flats; cost, each \$32,500; o, J. R. Palmenburg; a, Theo. E. Thomson.

ALTERATIONS.

57th st, n s, 265 w 6th av, br and s church; cost, \$20,000; o, Calvary Baptist Church; a, J. R. Thomas; b, F. Schmettler.

51st st, s s, 180 w 6th av, br stables and railroad car-house; cost, \$40,000; o, Broadway & Seventh Avenue Railroad Co.; a, A. D. Hatch.

BUILDING INTELLIGENCE.

(Continued from page 174.)

BROOKLYN—Continued.

14th st, n s, 97.10½ w 7th av, 4 2½-story and bmt br dwells; cost ea, \$3,500; o, A. P. Van Tuyl, Jr., 315 9th st; a, C. L. Lincoln.

Hull st, s s, 18.9 e Hopkinson av, 7 3-story br dwells; cost ea, \$4,500; o, T. Donohue; a, Benj. T. Robbins, Northport, L. I.

5th av, s w cor Garfield pl, 4 4-story b s stores and dwells; cost ea, \$12,000; o, a, and b, Assip & Buckley, 77 Waverly av.

76-78 Debevoise st, s s, 150 e Humboldt st, 2 3-story fr ten; total cost, \$8,000; o and b, Joseph Wagner, Jr.; a, Th. Engelhardt.

Lewis av, n e cor Halsey st, 4-story br store and ten; cost, \$10,000; o, Jos. P. Puels, Nosstrand av, n e cor Lexington av; a, W. Field & Son.

265-67 Stagg st, n s, 275 w Waterbury st, 2 3-story fr stores and ten; total cost, \$7,800; o, Adam Groh, 263 Stagg st, a, Th. Engelhardt; m, U. Maurer.

ALTERATIONS, NEW YORK CITY.

322 W 58th st, altns; cost, \$7,000; o, Emanuel Solomon, 85 Maiden lane; a, A. I. Finkle.

22 Fulton st, raised; cost, \$6,000; o, John Brosnan, 31 Vandam st; a, Edward Wall.

5 W 51st st, 3-story bay window; cost, \$8,000; o, C. P. Huntington, 65 Park av; a, G. A. Freeman, Jr.

251 E 33d st, 5-story br exten; cost, about, \$10,000; o, Bernard Metzger, 237 E 48th st; a, Henry Dudley; b, Bunn & Co.

83 Spring st, storehouse remodeled; cost, \$16,000; o, L. Sachs & Bro., 26 W Houston st; a, Richard Berger.

ALTERATIONS, BROOKLYN.

S 3d st, n s, 65 e Kent av, internal altns; cost, \$10,000; o, Havemeyer & Elder, cor Kent av and S 4th st; a, T. A. Havemeyer; m, John Farrell; c, J. E. James.

MISCELLANEOUS.

AKRON, O.—Contracts will be awarded today for constructing a 3-story st bldg 60 x 80' for J. Casper Keller; a, Jacob Snyder.

ANN ARBOR, MICH.—Spier & Rohns, architects, Detroit, have completed plans for a \$25,000 granite depot for the Michigan Central Railroad Co.

BENWOOD, W. VA.—A steel plant and a school-house is being built here. Five permits less than \$5,000.

BALTIMORE, MD.—A railroad depot will be built by the Maryland Central Railroad Company, near Boundary Avenue Bridge.

BROOKLYN, N. Y.—The Department of City Works will build a fire-engine house on Graham st nr Myrtle. Bids are in.

BALTIMORE, MD.—Jasper, n D. H. av, 3-story br dwell; o, Adam Schreider.

135 N Charles, 4-story br dwell; o, Dr. R. Buckler.

BOSTON, MASS.—12 Quincy st, cor Garrison st, br dwell; cost, \$10,000; o, F. J. Wood; b, Samuel Rantin.

St. Botolph st, near Hereford st, br gymnasium; cost, \$30,000; o, Allen Gymnasium Co.; b, Mead, Mason & Co.

Beacon st, near Chester st, br dwell; cost, \$24,000; o, H. W. White; b, D. W. Thomas.

Marlboro st near Davis av, br dwell; cost, \$26,000; o, Albert Moore; b, Thomas Ryan.

Adams st, br factory; cost, \$50,000; o, Matler, Baker & Co.; b, Gooch & Pray.

32-40 Moreland st, br dwells; cost, \$65,000; o and b, Ariel Low.

568-570 E Fifth st, br dwells; cost, \$6,000; o and b, D. W. Beckler.

Day, cor Perkins st, br school; cost, \$30,000; o, Perkins Ins. for Blind; b, Lyman, Rucke & Co.

S. W. Merrill & Son are building private residences at Nos. 125, 127, 163, 210, 212, 214, 285, 287, 289, and 295 Newbury st.

DETROIT, MICH.—169 First st, br dwell; cost, \$15,000; o, N. Coquard; a, A. E. French; b, Stephens & Co.

20 Bagge st, br dwell; cost, \$10,000; o, J. Robinson; a, A. E. French; b, W. H. Travis.

12 Grand River st, br hall; cost \$60,000; o, Y. M. C. A. of Detroit; a, Mason & Rice; b, Tapping & Fisher.

FARGO, DAK.—The Lutheran Society, W. F. Ulery, pastor, will erect a church bldg here. Contracts let.

HARTFORD, CONN.—The old city hall building is to be remodeled, Mr. Brooks Lincoln, architect, has been associated with Mr. Watson H. Bliss in the preparation of plans which are to be submitted to the mayor and committee of council.

(Continued on page 188.)

ANNOUNCEMENT.

The publication of the sixth revised edition of the U. S. Pharmacopoeia (1880), containing as it does much more strict requirements for the purity and strength of pharmaceutical preparations, has been followed in some States of the Union by the enactment of laws against the adulteration of drugs, which laws make the Pharmacopoeia the official standard.

In accordance with our established policy we shall, as in the past, use our best endeavors to furnish only such preparations as shall meet pharmacopoeial requirements. We are heartily in sympathy with all efforts which aim to improve the quality of medicines, and shall continue as heretofore to exclude all low grade and inferior articles and to use our influence to promote the sale and use of pure drugs and medical preparations.

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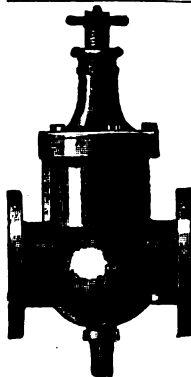


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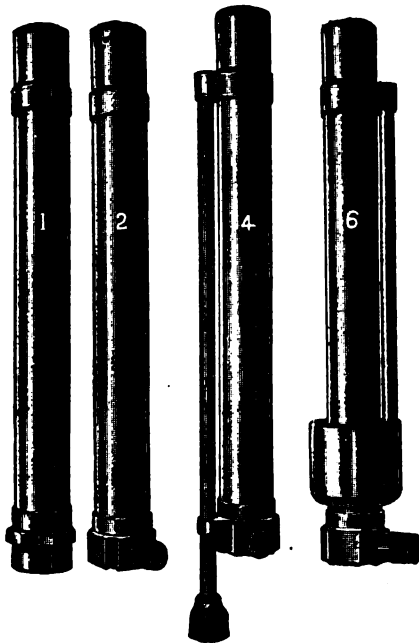
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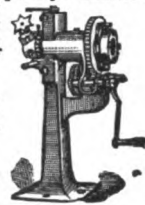
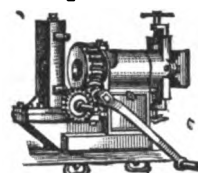
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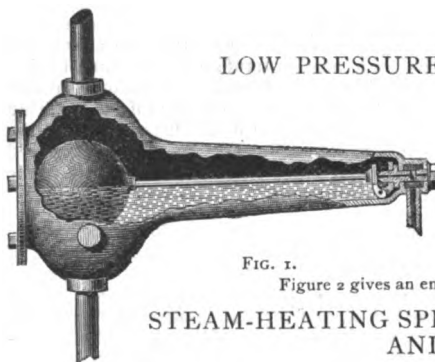


FIG. 1.

Figure 2 gives an enlarged view of valve and working parts.

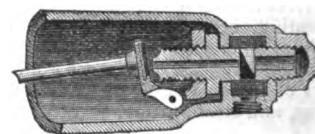


FIG. 2.

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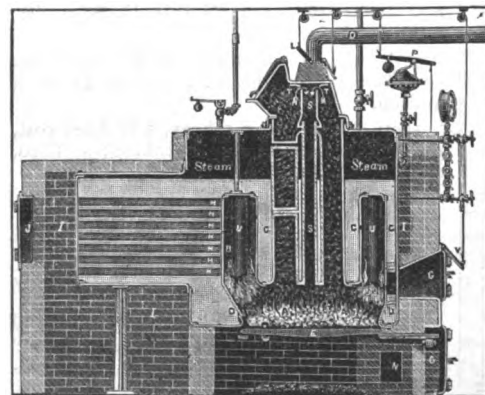
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DR. CARPENTER ON SEWAGE UTILIZATION.

IN an address on "Sewage Utilization by Irrigation" before the Farmers' Club of Croydon on June 5, Dr. A. Carpenter held that there is no occasion for sewers in country places without a public water-supply, and it is better to be without sewers than with them. But where there is a public water-supply sewers are necessary. To dispose of the sewage, the experience of the farm at Beddington showed that land properly treated is capable of taking out the whole of the mischievous matters that exist in sewage, utilizing them and sending them back into the town and the country in the form of food fit for the people's use. The land at Beddington has been used for purifying the sewage of from 30,000 to 60,000 persons for twenty-six years, and is as capable of dealing with sewage now as when it was first used, and although the value of the land has risen from less than \$5 an acre to from \$1,000 to \$1,500 per acre, the cost of the farm has never been more than eight-tenths of one per cent. in the assessed valuation of the parish.

By applying to an acre of land 5,000 tons of sewage, from 40 to 50 tons of produce have been sometimes obtained by six or seven mowings of rye-grass. This is equivalent to from 75 cents to \$1.25 per head of population contributing to the sewage.

By experimenting on rye-grass seed in flower-pots he had proved that for rapid growth it is necessary that sewage should be applied fresh. Fluids which have begun to decompose do not promote rapid growth of plants. The character of the material got from the farm is much more luxuriant if sewage is fresh than if it is putrid. It is, further, advantageous in point of health to use the sewage fresh. The smell will go immediately if sewage is put on the earth fresh. It must be used intermittently, also, in order to purify the sewage. It is necessary, also, to cut the rye-grass before it goes into flower so as to stop the maturing of the plant, otherwise it will mature and die, being a biennial. When the plants are beginning to get worn out the land must be broken up and mangel-wurzel grown upon it, and forty tons to the acre can be, and have been, raised. Then take a crop of cereals, such as oats, and then go back to rye-grass. Market gardening has not been as successful as the above treatment.

The address, which occupies five large columns of the Croydon *Chronicle*, was replete with interesting arguments and facts, the conclusions drawn from which are given in this abstract. The broad statement, however, that *no* sewers are required in places having no public water-supply certainly needs qualification. Referring to an article in another column, for example, it will be seen that about one-third of all the water-supply in Denver comes from private driven wells, and it would certainly be impracticable to dispose of some 3,000,000 gallons of sewage daily with no system of sewerage, and similar cases are of frequent occurrence where sewers

may be needed before the introduction of a general water-supply.

The more experiments of this kind that are made the more practical knowledge we shall gain, but we cannot yet endorse the idea of an entire abandonment of sewerage systems for all country towns without a public water-supply.

HEALTH IN THE WORKSHOP.

AMONG the list of grievances of the working man, as recited by those who are not working men, the insanitary conditions of the room in which he works are often dwelt upon, but the operative himself has usually very little to say on this point. Demands for more and better air, for freedom from dusts or from dangerous or offensive effluvia, have not come up in connection with any "strikes" so far as we know; in fact, there still exists in some of the trades a feeling like that which ruled the Sheffield grinders—viz., that it is better to keep the work somewhat unhealthy and dangerous, in order to prevent competition and keep up wages.

This feeling is, however, rapidly passing away with increase of knowledge, and the efforts of humane and wise employers to place their workmen in the best conditions for life and health are much better appreciated than they used to be.

If we are to judge by the amount of legislation and literature on this subject, much more attention is paid to it abroad than in this country. France and England have rather elaborate codes of laws and regulations relating to manufacturing establishments of various kinds—elaborate, that is, as compared with anything to be found on our statute books—a regular system of inspection is kept up, and mill and factory owners are encouraged and urged to provide devices for the prevention of accident and of disease.

The large and important treatise on industrial hygiene, recently published by Dr. L. Poincaré, Professor of Hygiene at Nancy, gives one a good idea of the care and detail with which these matters have been studied in France, and the reports of Dr. Dallard, of the Local Government Board, and the reports of the inspectors of factories of England indicate that the condition of things in that country is much better than it used to be.

But while not much has been done in this country in an official way as regards the health of workrooms, a great deal has been done by private enterprise. In our large cities the workrooms are often overcrowded, unventilated, and in bad condition, but in the numerous manufactories and mills scattered over the North, in the smaller towns and villages it will often be found that they are as light, airy, and well-arranged for health as could be wished.

Perhaps the greatest defect in the arrangements of our workshops where power is used is the want of means to prevent accidents. The preservation of the lives and limbs of workmen and workwomen is a matter of great importance in every point of view, but, owing to the fact that very few people have any idea of the frequency

of accidents in factories and workshops, the protection which can and should be afforded is too often wanting.

The Lomb prize essay by Mr. Ireland on the preventable causes of disease, injury, and death in American manufactories and workshops is particularly satisfactory to us because of the attention given in it to this point. The means of protecting from machinery, and especially gearing, by covers or fencing, are in most cases simple and cheap, provided that the machinery is not too crowded.

It must be confessed that many accidents with machinery are due to carelessness, and even deliberate disobedience of shop rules, on the part of the workman, this being especially apt to be the case in attempting to clean machinery while in motion; but even for these cases something may be done in the way of prevention by providing means for the prompt stoppage of the machine or of the engine in case a part of the dress or of the body gets caught in it. Mr. Ire-

OUR BRITISH CORRESPONDENCE.

The Local Government Board and the Darent Small-Pox Hospital—Disagreement as to the Disposal of London Sewage—Dr. Simpson at Calcutta—Need of Regulations Governing the Collection of Garbage, etc.

LONDON, July 10, 1886.

THE Local Government Board does not show up very well in their latest dealings with the managers of the Metropolitan Asylums Board. As previously intimated, the managers have had the judgment of Judge Pearson in their favor confirmed on the appeal of the plaintiff, Mr. Fleet. It will be remembered that the plaintiff sought to restrain the managers from erecting a permanent small-pox hospital at the Gore Farm estate, Darent. Having gained their case the managers were naturally under the impression that no further obstacle would present itself. The Local Government Board, however, has intervened, notwithstanding the fact that the plans have previously received its assent, and stopped further proceedings on the

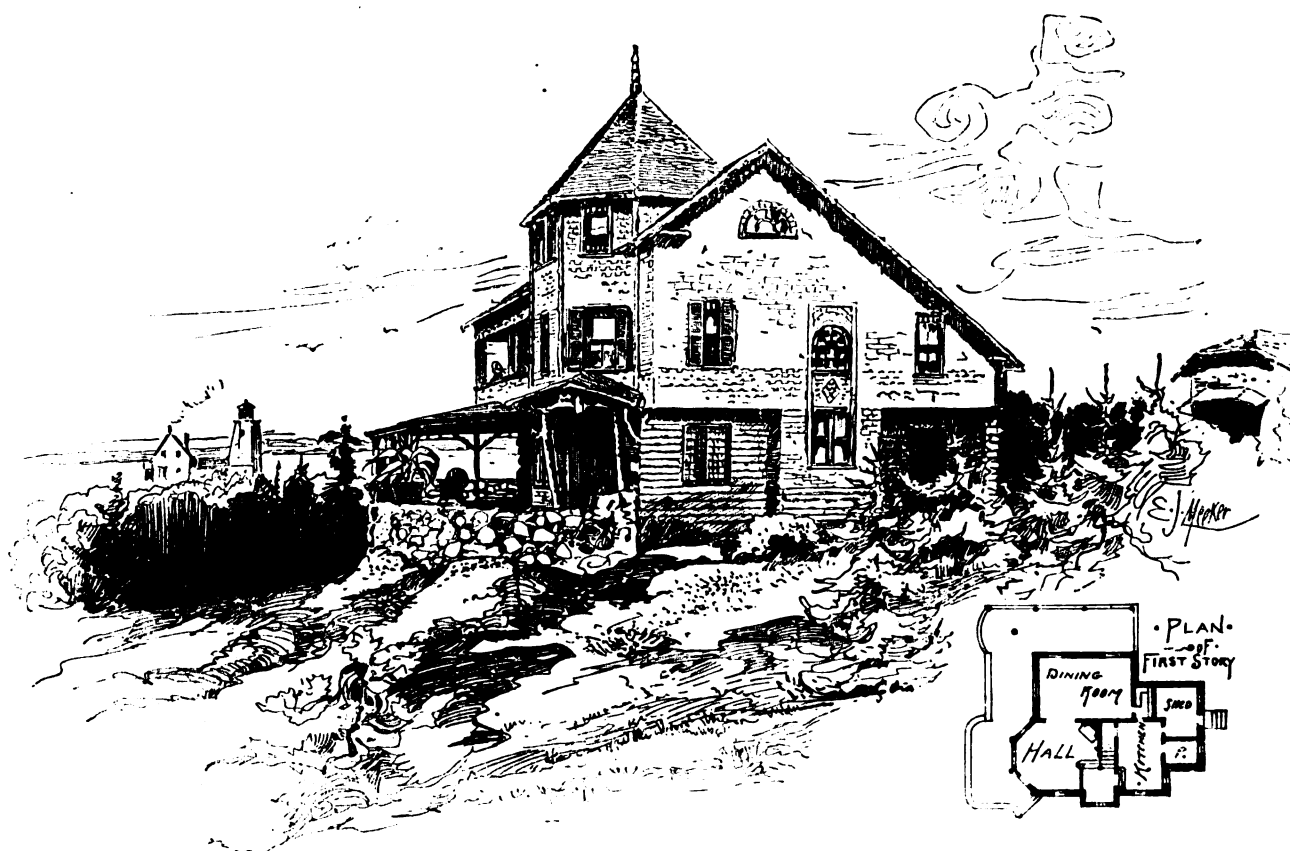
duties in Calcutta. The advanced school of sanitarians, who only obtained the appointment after considerable fighting, are to be congratulated.

Regulations are required restraining soap-boilers and dealers in hotel-kitchen stuff, waste, etc., from pursuing their business so far as the collections are concerned in such a manner as to give public offence. The swill-tubs into which the pails of stuff are emptied at the various places of call are in most cases without lids or other covering, and during the present spell of hot weather the smell proceeding from the refuse is offensive in the extreme. Closed vans should be compulsory. SAFETY-VALVE.

OUR SPECIAL ILLUSTRATION.

THE CHURCH OF THE REDEEMER, BRYN-MAWR, PA.—
CHARLES M. BURNS, JR., ARCHITECT.

THE church of the Redeemer at Bryn-Mawr, near Philadelphia, is built of Fairmount limestone, from a quarry about six miles from Bryn-Mawr, trimmed with white,



A COTTAGE AT CASTINE, MAINE.—CHAMBERLIN & WHIDDEN, ARCHITECTS.

land remarks that there should be a complete code of signals for the engine-room leading from every part of the factory where machinery is used, and that the gong used should be of a size to be easily heard in the boiler-room, so that the stoker can stop the engine if the engineer is absent, which is too often the case.

Much of the unhealthiness of workrooms in large cities is due to the fact that they are in buildings not intended for them, such as old private houses, etc., and are, therefore, without ventilation, or sufficient water-closet accommodation for the operatives. This is an evil which can be remedied by legislation which shall provide for constant and regular inspection of such places, but it can also be remedied to a great extent by action on the part of the workmen themselves.

This is one of those cases where the demand will produce the supply. When pure air and freedom from risk to life and limb are considered in connection with the fixing of wages scales, improvement will be prompt and rapid.

ground that expert opinion as to the construction of small-pox hospitals, and to the number of patients under one administration, is so undecided that it is undesirable to lock up large sums at present in permanent structures which may shortly be condemned. The board further recommends the erection of temporary huts. The managers have every reason to complain of such vacillating on the part of the board, and the recommendation that they should revert to their old system of huts, which they have found so expensive, provokes comment. The cost of the huts, 1884-5, was some £40,000 (\$172,000), while the estimated cost of a permanent building would be £120,000 (\$576,000).

The Metropolitan Board of Works and the Home Secretary, representing the Royal Commission on Metropolitan Sewage, are in disagreement. The former body is desirous of permanently adopting the system of treating the sewage by chemicals for precipitating and disintegrating purposes, whereas the Royal Commission condemns it.

I see from a Calcutta paper that Dr. Simpson, the late Medical Officer of Aberdeen, has entered upon his new

red, and black brick from the Peerless Brick Co., of Philadelphia, which is used in the arches and string-courses. The grayish-white brick predominates and harmonizes admirably with the color of the stone.

The church cost about \$23,000, not including furniture or stained glass, but could certainly not be built now for less than \$28,000.

The altar and reredos were put in after the church was finished as a memorial of the former rector, the Rev. Mr. Licett. Several of the stained windows are also memorials. The rood-screen, finished about eighteen months ago, is of wrought metal resting on a stone base, and is one of the most elaborate pieces of metal-work ever made in the country. It was put up as a memorial to Mr. Charles Wheeler, who was formerly identified with several large institutions in Philadelphia, and was the head of the firm of Morris, Tasker & Co.

The cross over Mr. Wheeler's grave in the churchyard, which is shown in the foreground of our illustration, is of oolitic limestone.

The architect is Mr. Charles Marquand Burns, Jr., of Philadelphia.



THE SANITARY ENGINEER ILLUSTRATED SERIES.

THE CHURCH OF THE REDEEMER, BRYN-MAWR, PA.

CHARLES M. BURNB, JR., ARCHITECT.

OUR ILLUSTRATION OF A MODERATE-COST HOUSE.

A COTTAGE AT CASTINE, ME.—CHAMBERLIN & WHIDDEN, ARCHITECTS.

THIS house is the summer residence of Mr. Frank Wood at Castine, Me. The lower story is of log construction; above that the building is framed and covered with shingles. Half logs of small scantling take the place of eaves moldings, and are used to emphasize the corners of the tower. The same rustic construction is continued in the interior, where the logs show as in the cabins of the early settlers, and the trunk of a silver-birch tree with the bark on is used as the newel-post of the staircase, and runs up to the ceiling, the timbers of which are also unhewn logs.

The architects are Messrs. Chamberlin & Whidden, of Boston.

KANSAS CITY, MO., EXCHANGE BUILDING COMPETITION REPORTS.

[We print below the reports of Mr. Edward H. Allen, President of the Exchange Building Association, and Professor William R. Ware, of Columbia College, on the competition for the Building Exchange Building, and also the memorandum of Messrs. Burnham & Root, of Chicago, the successful competitors. We think these reports will prove of very great value to all architects and building committees who may propose hereafter to enter or conduct competitions for designs of buildings.]

In a note accompanying the printed report Professor Ware expresses his regret at being unable to comply with the request of a number of the competitors, that he would give a detailed opinion of their work, and asks that competitors notify him of their willingness or unwillingness that the designs should be sent to the Kansas City Society of Architects for exhibition, as afterward to New York and elsewhere.—ED. SAN. ENG.]

In fulfillment of the promise made in the printed *Instructions* issued to the competitors, we present for their information this account of the results of the competition.

Fifty-three designs for the Exchange Building were sent in on the 15th of June. Of these, ten admitted light and air by means of several small areas or wells, twenty-five mainly by a large area at the back, six by a large area at the front, the building occupying three sides of an open court, and nine by a large court in the middle of the building which in two of the designs was covered by a sky-light.

The large hall for the Board of Trade occupied in one design the basement, the first, second, and third floors; in three, the first, second, and third floors; in eighteen, the second and third floors; in seven, the second, third, and fourth floors; in two, the second, third, fourth, and fifth floors; in one, the third and fourth floors; in twenty, the fourth and fifth floors, and in one, the fifth floor only.

In twenty-one, the large hall was in the middle of the front; in eighteen, at the end, upon a side street; in eight, it faced the front and side street; three were upon large courts in the rear; one upon the courtyard in the middle of the front; one extended the whole length of the front, and one was in the middle of the rear.

In thirty-one of these designs the safes were distributed in stacks throughout the building; in eleven they were concentrated in the basement; in ten, they were shown in the basement and first floor, and in one, on the first floor.

The restaurant, in thirty-two designs, was placed in the basement; in eighteen, at the top of the building, and in three, upon the first floor.

In respect of style and external treatment sixteen were designed in some variety of Roman or Renaissance architecture, nine with a tolerably strict, and nine with a somewhat free use of Romanesque or round-arched mediæval motives, and not a single one in the pointed Gothic style, either modern or mediæval which, twenty years ago, or even ten years ago, was almost universal. There were seventeen designs, two or three of great merit, in which it was difficult to detect any special historical influence.

On opening the seals it appeared that in two cases two sets of drawings came from the same hands, in another three, and in another four. The result serves, however, rather to commend the course of the successful competitors, who made numerous duplicate designs for their own

use, as a means of study, submitting to the committee only the one they believed to be the best.

The provisions of the printed instructions proved to have been carefully complied with in every case, except that in one design the building had windows on the north side, where the plan furnished showed a party wall, and one design showed a building of eight or nine stories, disguised as mezzanines, instead of five or six. These were accordingly thrown out of consideration at the start, as were also some drawings of details which accompanied another of the designs.

A list was then made of fourteen which proved to have the best plans, and another of twenty-one, which had the most acceptable perspectives. Six designs were found upon both lists. • To these six ten more were added from those of such marked excellence in either respect as to deserve further consideration. These sixteen drawings were then critically compared with reference to the provisions made for the general convenience of the public and of the Board of Trade, for lighting and natural ventilation, for office-room and rental, and for a suitable architectural character and expression, and the memoranda that accompanied them carefully read. They were then arranged in series under each of these heads, and those that stood highest on the greatest number of lists were then further considered on their general merits. Five of these were finally selected to send to the Building Committee as being on the whole distinctly superior to the rest, for one reason or another.

In estimating the area of the small offices, floor-space more than twenty-two feet from the windows was not counted, and in estimating their value, those upon outer walls were considered twice as good as those upon enclosed courts and areas.

This work, in which the professional adviser of the association was aided both in the clerical labor it involved and in the more difficult task of criticism and judgment by a number of his friends—the value of whose assistance he hereby gratefully acknowledges—occupied just a week. He then opened all the envelopes and reviewed his action in the light of the information they furnished, but without finding reason to change his mind. On Thursday, the 24th of June, the five selected designs were sent to the Building Committee in Kansas City for their final judgment, with a written report, containing some comments upon the designs, but without any special recommendations. These reached the committee on Monday morning, June 28. This paper is printed below.

After diligent and almost continuous study, the committee, on Wednesday, June 30, came to a unanimous opinion. This they reported to the Exchange Building Association in the following terms:

"After a careful and detailed examination of these designs, your committee rejected two as unsatisfactory, because in one instance the office-rooms intended for renting contained too much floor-space to admit of a satisfactory rental from the building, and in the other instance, too large a floor-space was given to ante-rooms of little or no rental value. Of the remaining three, no one of which was entirely satisfactory, though each one contained very decided advantages of one character or another, the committee finally rejected one because the large hall of the Board of Trade was without windows in the side walls, being lighted and ventilated through the ceiling, which your committee was persuaded could not be satisfactory to the users of the hall. Of the two then left, your committee finally selected the one marked 'UTILISSIMUS,' which was plainly the best of all for the lighting and ventilation of the offices, giving to the halls the best positions possible, and furnishing the largest number of offices for rent in the best groupings for advantageous use, and on the whole, promising probably [the largest returns of income, and admitting of the correction of all supposed defects with the least interference with the main features of the plan."

Upon being assured by their professional adviser, who had meantime been summoned from New York, that the alterations suggested could easily be made, and that the author of the plan in question was entirely deserving of their confidence, the committee formally voted to accept this design. The envelope containing the names of the five selected competitors being then opened, they found the selected design to be the work of Messrs. Burnham & Root, of Chicago, the other four, in the order of their preference by the committee, coming from Messrs. Edbrooke & Burnham, of Chicago; Messrs. Weston & Tuckerman, of New York; Mr. John L. Faxon, of Boston, and Mr. W. W. Clay, of Chicago.

Although only these five designs were submitted to the committee for consideration, all the perspectives were sent to them for their information, and to gratify a reasonable curiosity.

The committee took no steps toward determining the relative or absolute cost of the buildings shown, believing that this was largely within their own control, being determined by the special materials or methods of construction they might adopt. These points they could most profitably consider in consultation with the author of the selected plan.

The course of this competition has thrown some light upon several questions which, in discussions upon this subject, have been much debated. It has been questioned, for instance, whether it is desirable to have drawings made in perspective, the impression being a prevalent one that such drawings are likely to be misleading and deceptive, giving a much more favorable impression of a design than it deserves. However this may be with perspectives finished in water colors, the contrary seems to be conspicuously the case with drawings in line, such as were asked for in this instance. The perspectives have in this case served mainly to bring into prominence defects of design that were not noticeable in the elevations, only those designs that presented a plane surface, almost unbroken by recesses and projections, seeming to be secured against a very serious disparagement when thus presented. In other cases, the composition of wall and window, plain and decorated surfaces, which in elevation looked all right, would often, when put into perspective, fall into shapeless disorder. Such drawings seem, then, especially where the point of view is taken as near the building as in this case was necessary, rather to bring out the latent defects of a design than to invest it with fictitious merits.

It has been a matter of debate, also, whether the practice of concealing the identity of the competitors under a fictitious name was of any value, the opinion obtaining that it was always easy to penetrate the disguise. The contrary has been the case, however, in this instance, the most confident convictions of half a dozen tolerably experienced architects having been ludicrously set at naught when the real authors of these designs became known. Only one or two correct guesses were made at all, and these took the form rather of surmise than of definite recognition.

This *incognito* has, moreover, proved to be of great practical convenience in judging the designs. Although, as was distinctly set forth in the paper of Instructions, the committee intended to be guided in their final choice by personal and other business considerations, as well as by the relative merit of the designs submitted, they were very glad in examining the five sets of designs that came before them, as their professional adviser had been in selecting these five, to keep the two questions apart, and to be able to discuss the drawings solely upon their merits, leaving other matters to be considered when their time came. It was felt that to have entertained both questions at once would have been greatly to complicate and embarrass the discussion.

Some light has also been thrown upon the vexed question whether the final choice among the competitors should lie with a building committee or with the experts whom they may bring into their counsels. It is certainly best that a committee should put the chief labors of examination and inspection into the hands of professional inspectors, if for no other reason than this, that in no other way can they so effectually inspire confidence, and prove themselves to be above partisanship and intrigue as by putting the exercise of favoritism out of their power. But it is not necessary to this end that they should have no voice in the selection, and questions may well arise, as in the case in hand, which demand for their solution an act of absolute and arbitrary choice which only the proprietors, or the committee representing them, are in a position to exercise. What relative importance to attach to rental, convenience, and general architectural expression and character and what, on the whole, convenience will require, are not questions for a professional expert, but for his clients. In the present case the professional adviser of the association was able to select five designs with a certain confidence that each was, on its own ground, superior to the remaining forty-eight. But the differences between these five were differences rather of kind than of degree, raising questions, as is shown in the committee's report to the association, which only the owners could answer. It would have been impossible and improper, in this case at least, for any professional adviser to make their choice for them.

This competition has demonstrated, also, what there has been too much reason to doubt, that if proper regulations are made, it is possible to carry on such a contest and bring it to a conclusion without the exercise of any personal influence whatever on the part either of the judges or of the contestants. The committee and their adviser had, in this case, no knowledge or intimation of the authorship of any of the designs until after their judgment was formed. The competitors, also, with one or two insignificant exceptions, abstained absolutely from any attempts to exert any outside pressure upon them, and in these cases were signally discomfited.

The designs sent in have not been seen by the successful competitor nor by any persons except those mentioned above as having been specially invited to inspect them, and they will be forthwith returned to their owners, unless they otherwise direct.

EDWARD H. ALLEN.
WILLIAM R. WARE.

REPORT.

Edward H. Allen, Esq., Chairman of the Building Committee of the Kansas City Exchange Building Association.

SIR: In fulfillment of the task intrusted to me by the Exchange Building Association, I have examined the fifty-three designs for the Exchange Building which have been sent in to me, and herewith enclose to you, in accordance with the provisions of the printed instructions, those which I find to be the best among them, five in number, with the following comments:

These five designs are, in my judgment, distinctly to be preferred, for one reason or another, to any of the remaining forty-eight. Any one of them, if carried out substantially as shown in the sketches, would give the association an excellent and satisfactory building. This being so, it is for the committee to decide which, on the whole, best meets their wishes as promoting their own convenience, or as furnishing a good business investment, or as possessing a suitable architectural character.

I.—The design designated by a Corinthian Capital offers the largest number of offices to be let for business purposes—one hundred and five in all, besides four railroad offices. Of these one hundred and five, eighty are upon external walls and look into the streets, and twenty-five are lighted from an interior court. This court is, however, of exceptional size. The safes are concentrated in the basement, where the restaurant also is placed.

The large hall for the Board of Trade is on the second story, and is lighted entirely from the ceiling, being under the large court. This leaves the main part of the building for offices, which accounts for their exceptionally large number.

The exterior of the building is dignified and monumental, without affectations of any kind, and in general expression and character is entirely suited to the purpose for which it is designed.

II.—The design marked "Utilissimus" is second in number of offices, having, besides eight railroad offices, ninety-eight smaller offices. All but six of these are upon external walls, and thirty of them are connected with secondary rooms in the rear. If these are counted separately, the total number of small offices is one hundred and fourteen.

In this design, besides the safes accumulated in the basement, a considerable number are distributed through the building. The restaurant and most of the water-closets are in the fifth story.

The large and small halls occupy the fourth and fifth floors in the northern wing of the building, and the offices connected with them the southern wing of the fourth floor.

Light and air are introduced into the interior of the building by a large court open to the street upon the south side. At the back of this court is an excellently designed tower, giving the building an effective and striking individuality. The rest of the design, however, seems to leave something to be desired in point of architectural character and expression.

III.—The design marked with a T-square and Triangle is the third in respect of the number of offices and first in the amount of floor-space given to them. Besides four large railroad offices, there are eighty-nine small offices, of which sixty are on external walls and twenty-seven on an area. Thirty-nine of these upon the outside walls are connected with twenty-three interior rooms. If these are counted as separate offices, the whole number amounts to one hundred and ten.

The restaurant is in the basement, and the safes are distributed in stacks through the building.

The large hall occupies the fourth and fifth stories at the east end, the offices attached to it, with the small hall, filling all the rest of the fourth story.

The exterior is treated in the Romanesque, or round-arched mediæval, style now coming into vogue, and is, perhaps, more agreeable in itself and more suitable for a building of this kind than any of those designed in this manner. It is quite free from extravagance and eccentricity.

IV.—The design marked "Anti-Cyclone" shows five railroad offices, all double, thirty-nine exterior offices, of which twenty are double, and seventeen on a court, of which twelve are double, making fifty in all. If the extra rooms are counted separately the whole number amounts to eighty-eight.

A few safes are shown, distributed through the building. The rest are in the basement.

The large hall occupies the second, third, and fourth stories at the west end, the offices attached to it and the small hall being in the second story.

The external aspect of this design, though not following the prescriptions of any special historical style, presents a simple and dignified architectural composition, eminently adapted to the important place this structure is meant to take among the public buildings of the city.

This is one of the few designs submitted which appears as well in perspective as in elevation. The tower with which it is adorned is unusually well composed, simple, and elegant. It is to be noticed, also, that the two external courts on the rear, though not so wide as they well might be, not only give light and air to the rear offices and water-closets, but serve to detach the building from the rest of the block, to the great advantage of its appearance—making it virtually an isolated structure.

V.—The scheme marked with "a pair of compasses and a carpenter's square," gives five railroad offices and sixty-one others, all single, of which forty-seven are exterior, nine on a small area, and five on an interior well.

The large hall is larger and higher than in most of the others, occupying the whole of the second, third, and fourth floors in the eastern end of the building. The offices attached to it, and the small hall occupy the rest of the second floor.

In many of the designs submitted, the large hall was planned in the middle of the front, either upon the second and third, or in the fourth or fifth stories. But none of the competitors who adopted this arrangement succeeded, in my judgment, in giving it a satisfactory architectural treatment. Yours, respectfully, WILLIAM R. WARE.

New York, June 24, 1886.

MESSRS. BURNHAM & ROOT'S MEMORANDUM.

Regarding the design for the Kansas City Board of Trade Building, placed in competition by UTILISSIMUS.

This competitor began a study of the problem by laying out all plans he could devise as feasible for such a building and lot. Their value as to exterior light and air was then compared; and the one herewith submitted giving the best results, was therefore chosen.

It depends but little on interior courts, and opens well to the south, from whence comes most of the sunshine and the summer breezes.

The plan, therefore, suggests the motto, which latter represents the practical design, and is not intended to refer to the maker of it.

Following out this scheme of looking first and only to practical utility in the consideration of all main questions, the outside of the building is to be almost entirely of red brick and red semi-glazed terra-cotta.

First—Because these materials alone are fire-proof.

Second—Because they are always bright and warm in their glowing monotone.

Third—Because they keep clean and do not grow dingy with age.

Fourth—Because, most especially, good effects are obtainable by these materials more cheaply than by any other known to your designer.

Some quality of dark brown sand-stone is intended for the basement, but the faces of the piers, even here, between water-tables, will still be simply red brick in order to prevent the piers giving way at this point under a fire, which would be extremely disastrous.

The use of the different stories is as directed by you, but the necessary height of the great trading room dictates an attic on the right wing. This is fortunate, as it gives

ample space for the house and elevator tanks, their various connections, circulating-pipes, etc. Also for ventilating machinery, and for rooms for the engineer and janitor. The tower is placed at the rear end of the great south court where it will command the mass from the only available point of view one ever gets in our narrow city streets—namely, from directly in front of the building looking up this space.

A tower would be of little or no value on any street frontage, and therefore it was with gladness that your designers found they could avail themselves of the shape of the plan for this purpose. Late observations of this arrangement have satisfied us of its stately effect.

However, a tower may be dispensed with for economy's sake and a different and lower treatment devised in its place, which will fitly end the perspective at this point. Indeed, any tower will probably have to be left out of the actual building, in view of the small appropriation made for the same. But if it remains, such a position as designed would undoubtedly be the best place for it.

Please notice that the elevators are placed where most convenient for all three entrances and where the light is of least value for offices. Please note, also, that each wing has a court up through it, illuminated in one case by skylights in the roof, and in the other by Hyatt lights in the floor of the great trading-hall.

The main entrance is domed with Hyatt lights. The water-closets are principally located in the upper floors, where most approved by late experience in New York and Chicago.

Fire-proof vaults are built up through as shown because,

First—They are cheaper than any competent safety deposit made by itself would be.

Second—Because offices rent with them more readily than without.

Third—Because they add greatly to stability in the construction.

Finally—Because the building will be stronger, more economical, and more remunerative with them than without.

The plan lends itself to these vaults perfectly. In several cases in the city in which your designer lives it has been found by agents having charge of buildings that massed vaults, although in each story, are almost useless, and that the absence of regular vaults is a bar to renting in many cases, even when public vaults in each story are offered in lieu of them.

It is not deemed necessary to more minutely describe this design, as the author of it has full confidence in the professional adviser, and feels that under his investigation everything of value will be brought out without tediously calling his attention to the same herein. Respectfully submitted, UTILISSIMUS.

SANITARY MATTERS IN THE WEST.

(From our Special Correspondent.)

THE recent meeting of the American Society of Civil Engineers in Denver enabled many from the older-settled parts of the country to see and appreciate the fact that their brethren in the West are fully alive to the necessity of using the best science available in caring for the health of the people.

From the pamphlet furnished by the Denver Society of Engineers and other sources we condense the following notes:

Water was first introduced about seventeen years ago. Wells forty feet square and fifteen feet deep were sunk in the sands of the South Platte River, from which about 3,000,000 gallons were pumped in twenty-four hours. Nine years later a stone dam was thrown across the river at a point three miles above the town, forming a lake two miles long, from which a canal five to fifteen feet deep led to a new pumping-station one mile above the town, giving a head at the lower end of twenty-eight feet. At this point two 54-inch turbines were located, driving four pumps of a capacity of 6,000,000 gallons per day. Two years later steam pumping-engines of about equal capacity were added.

The water is pumped directly into the mains without reservoir or stand-pipe. The water was passed through a sand filter ten feet thick and with 2,000 feet of exposed surface, but in time this filled with silt and became practically impervious to water. Attention was then turned to artesian wells, but it became evident that enough water could not be obtained from that source. On sinking a series of wells across the valley it was found that

the water stood in them at the same level as that in the river, and a test by pumping some of these wells showed the amount to be obtained to be dependent on the surface drained, and that the water was of excellent quality. To utilize the supply a small reservoir holding 12,000,000 gallons was built at the works. This has earth embankments sixteen feet wide on top, inside slope 2 to 1, outside slope $1\frac{1}{2}$ to 1, and is lined with flagstone laid in cement. From this a wooden barrel-conduit of four feet inside diameter is laid up stream under and along the canal and lake on a grade of two feet per mile for two and a half miles. Here the pipe passes under the river with a dip of ten feet in the grade and rises on the west side so as to be five feet below the river bottom. From thence two crib galleries, two feet high by three feet wide, extend 300 feet each way at right angles to the main pipe, and from these the supply is drawn. The main is extended one mile further up the river, and about 1,000 feet more of galleries connected with it. The capacity is estimated at 17,000,000 gallons per day, but only about one-third of this has yet been drawn.

The conduit is made of staves six inches wide and two inches thick, breaking joints, and driven together at the ends on shims of band-iron $1\frac{1}{2} \times 1\frac{1}{8}$ in slots sawed into the ends.

The hoops are of $\frac{3}{8}$ -inch round iron, drawn tight by a nut in a cast-iron clip. There are five check-gates arranged so as to keep the pipes full and prevent all danger from decay.

The galleries are made with sides of 2×6 planks spiked together on blocks $\frac{1}{2}$ -inch thick, the bottom being left open and the top covered with 3-inch spruce plank. The cribs are first packed on the outside with stone and coarse gravel and then with gravel and sand. The upper galleries are twelve feet below the bed of the river.

About forty miles of distribution-pipes have been laid, and the present value of the works is about \$1,000,000.

The use of artesian wells by private parties has been quite largely introduced and the supplement to the supply thus obtained is at present over 3,000,000 gallons per day. We shall refer to these more at length at a future time.

Irrigation water for shade trees is taken direct from the river, and flows in clear bright streams down the gutters of each principal street, being turned into the cross streets as often as may be necessary to irrigate the trees growing on them.

Sewerage is provided for house-drainage only.

The outlet, or "public" sewer, is of brick, thirty inches in diameter, and empties into the river. The depth of flow in this in December, 1885, was thirteen inches. A 24-inch brick branch had $5\frac{1}{2}$ -inch and two 18-inch pipe-branches, six and nine inches depth of flow respectively. This was with 24 per cent., 43 per cent., and 67 per cent. of all the connections made that ever will be in the several districts drained.

The grade of the public sewer is uniformly one in 400, and most of the "district" and laterals have the same grade. The alley laterals where extending one block are nine inches, and where two blocks twelve inches and nine inches diameter. These are more easily flushed, and thought much less liable to be stopped by foreign articles than smaller pipe would be, and "slop-waste" has not been prohibited. The stoppages have been almost none (four only in three years), and the total expense from stoppage less than \$100 per year.

The velocity of flow is remarkably uniform at about three feet per second ($2\frac{1}{2}$ to $3\frac{1}{2}$), and as a result the sewer contents reach the river in such a state as to produce no sensible odor.

The cost of the district sewers has been from $1\frac{1}{8}$ cents to $1\frac{3}{8}$ cents per square foot of area drained. At the present date there are $25\frac{1}{2}$ miles of public and district sewers, and twenty-three miles of laterals. More sewers are required and will be built as soon as some legal questions as to the mode of assessment are settled.

The laterals were at first flushed twice a week by dropping about 700 gallons of water from a movable tank into the terminal manholes. Two such flushings were required to cleanse the pipes. The annual cost of this was about equivalent to the interest on an investment of \$250 per manhole, aside from the wear and tear of pavements and hydrants.

After long experiment an automatic valve and flushing-shaft has been devised by Mr. H. C. Lowrie, the City Engineer, which works well. Fifteen of them are now in use, one continuously for two years. The cost per shaft,

including cementing of brick-work and connecting water-shaft, is \$40 each.

This trap, the flushing-shaft, etc., were fully illustrated in THE SANITARY ENGINEER of February 26, 1885. We here reproduce (see Fig. 1) a section of the trap to show the compression-ring since introduced. This serves the double purpose of cleaning the ball and of varying the

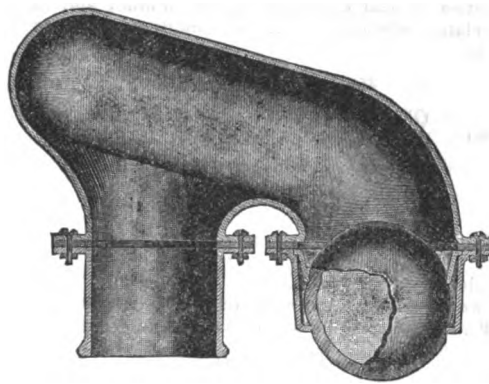


FIG. 1.

head required, by increasing or diminishing the amount of compression. For a 6-inch ball the ring is usually made about $5\frac{3}{4}$ inches diameter. This trap has also been introduced in soil-pipes of dwellings, where about 100 have been in use for over a year with no complaints.

Lamp-holes were at first introduced in all sewers, but their use has been abandoned, as they were found to be sources of damage and were not needed, since great care has been taken in the alignment and level of the sewers, and in nearly all cases a light can be seen from one man-hole to the next.

For cleansing small sewers rods of wood, with a smooth unlockable joint, are used. For keeping the line of small pipes while laying them, an apparatus is used consisting of four strips of wood about ten feet long, moving radially in and out through metal slots, and with springs for pressing them outward against the pipes as the apparatus is drawn through them. The metal slots are placed at three points in the length of the strips. Inspectors of the work are required to make daily reports on printed forms.

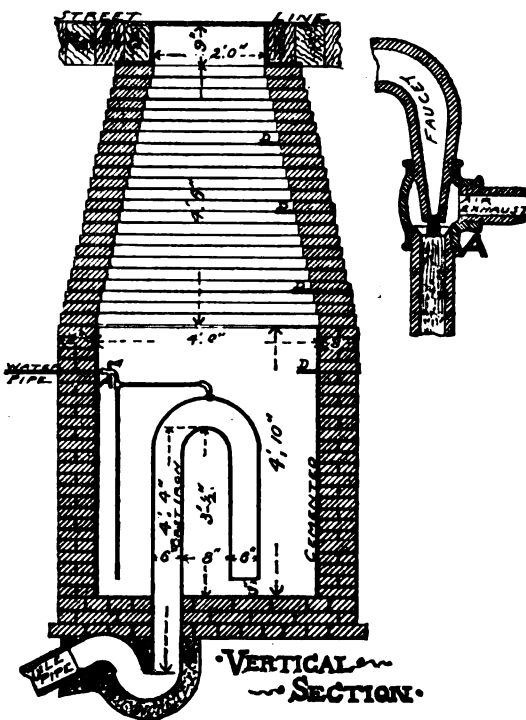


FIG. 2.

From the report of the City Engineer of Omaha, Mr. Andrew Rosewater, we learn that the sum of \$257,175 was expended last year for grading, curbing, paving, sewerage, etc., giving a total of twenty-two miles of sewers, and $11\frac{1}{4}$ miles of paved streets. The total expenditure to date is for sewers \$466,768, and for paving \$1,100,000.

All the sewers are doing good service except two lines, about two-thirds of a mile long each, built of 6-inch pipes on the Waring system. These are each forced to carry about 250,000 gallons daily, which is in excess of their capacity. They were calculated to run one-third full from sewage only. The excess is due to the large number of hydraulic elevators that has been connected with them.

The engineer recommends that the elevators be cut off and connected with the storm sewers, and, to prevent overflow of the latter, that the catch-basins be throttled to prevent more storm-water entering than the sewers will carry.

The catch-basins are built *without* traps, but the base is slanted toward the sewer inlet-pipe so that all mud is carried into the sewer while in a state of solution, and out into the river. No offensive odor arises, and the expense of cleaning the basins is avoided.

At the upper ends of all sewers an automatic flush-tank, designed by Mr. Rosewater, is placed, of which Fig. 2 is a cut. These are said to work well.

An expenditure of \$250,000 more for sewers is imperative on account of the rapid growth of the city.

In reference to pavements, the engineer states that where stone gutters are not laid soft spots are developed in time in pavements in street asphalt. Also that toothed stone blocks are found to be necessary along all railroad tracks. Present specifications call for a 2-foot granite gutter, and stone toothing along street railway tracks, on all streets paved with street asphalt. An experiment is to be tried of a 4-inch thick concrete base for such pavements laid in Portland cement, in place of one of 6-inch laid in American cement.

Two expensive viaducts crossing railroad tracks are under construction.

ON THE RELATIVE ECONOMY OF VENTILATION BY HEATED CHIMNEYS AND VENTILATION BY FANS.*

OF the various modes of producing the air currents by which vitiated air is removed from chambers, halls, or working places, and fresh or pure air simultaneously introduced, involving the processes of ventilation, the heated chimney is the most common; although it is generally recognized that where large volumes of air are to be moved against considerable passive or frictional resistances, the use of the fan or blower is theoretically the most economical.

The following investigation has been undertaken with a view of establishing the exact theoretical relation between these two modes of ventilation, as far as economy of heat is concerned, and incidentally to determine, as far as the uncertain elements of the question may permit, the circumstances under which either of these methods may advantageously be employed in preference to the other; it being understood that the ventilation of public buildings, mines, suites of rooms, or single large rooms are all included in the problem.

It is assumed that since air is everywhere present at the earth's surface, ordinary ventilation is accomplished by a simple movement of air, all portions of which exist under the same pressure before motion begins; and that, therefore, the problem does not involve the lifting of the air through a determined height. The resistance to motion, or the forces to be overcome, are then the frictional resistances of the passages through which the air flows, and the inertia of the air put in motion. The expression frictional resistances is to be understood as implying all those resistances which oppose or obstruct the motions of fluids through conduits or channels, and which are usually expressed in terms of the height due to the actual velocity of flow, or are proportional to the square of the actual velocity of flow.

The work per second necessary to overcome these resistances may be expressed by the weight which flows per second, multiplied by the head or height of a column of fluid, which, expressed in terms of the velocity of flow, represents the total resistances. The frictional head for a given condition of things—a given conduit and passages—is usually expressed by a constant depending on the length, form, and dimensions of the conduit and passages, multiplied by the head due to the velocity of flow; or by an expression having the form

$$F \frac{v^2}{2g}$$

The work performed in putting a weight of air represented by w in motion with a velocity v per second will be therefore

$$\bar{W} = w \frac{v^2}{2g} (1 + F).$$

If there are no resistances except those due to the inertia of the moving masses of air, the constant quantity F disappears, and the work will be that represented by

$$w \frac{v^2}{2g}$$

the living force or actual energy imparted to the air per second.

In any investigation having for its object the relative economy of the methods of putting the same quantity of air in movement per second, through the same channels,

* A paper read by Prof. W. P. Trowbridge, of New York City, at the Chicago Meeting of the American Society of Mechanical Engineers.

and with the same velocity, it will be sufficient therefore to consider the work

$$w \frac{v^3}{2g}$$

since the work performed per second in both cases must be the same whether the frictional resistances are considered or not.

It is further to be remarked, that by whatever means air is put in motion under the circumstances which we are considering, the process consists in a reduction of pressure at one point, whether a fan or a heated chimney be used, which creates an unbalanced head in the surrounding air, and a consequent flow to the point of reduced pressure.

This unbalanced pressure per square foot of section produced by a heated chimney is represented by the expression:

$$(1.) \quad p = H. (D_a - D_c),$$

in which H represents the height of the chimney, D_a the weight per cubic foot of the external air, and D_c the weight per cubic foot of chimney air.

The height of a column of fluid, whether of chimney air, external air, water, or mercury, which would represent this pressure is found by dividing the above value of p by the density of the fluid, thus for chimney air:

$$(2.) \quad \frac{p}{D_c} = H \left(\frac{D_a - D_c}{D_c} \right) = H \left(\frac{T_c - T_a}{T_a} \right),$$

because, $\frac{D_a}{D_c} = \frac{T_c}{T_a}$,

T_c and T_a representing the absolute temperatures of the chimney air and the external air respectively.

In this last expression

$$H \left(\frac{T_c - T_a}{T_a} \right)$$

represents the height of a column of air of a uniform density D_c , which, by its weight would give a pressure per square foot represented by P .

The velocity with which air would flow under this head or pressure is

$$(3.) \quad v = \sqrt{2gH \left(\frac{T_c - T_a}{T_a} \right)}.$$

The work per second produced by the chimney for each square foot of cross section will be

$$(4.) \quad \bar{W} = p v = D_c v. H \left(\frac{T_c - T_a}{T_a} \right).$$

Substituting the value of v from (3) we have

$$(5.) \quad \bar{W} = D_c \sqrt{2gH^3 \left(\frac{T_c - T_a}{T_a} \right)^3} \text{ foot lbs.}$$

This is the work per second in foot pounds accomplished by the expenditure of heat in heating the air of the chimney, and thus producing motion.

The quantity of heat thus expended is represented by the expression

$$(6.) \quad Q = D_c v. c_p (T_c - T_a),$$

in which Q is expressed in units of heat, $D_c v$ represents the weight of air which passes through each square foot of cross section per second, and $(T_c - T_a)$ the number of degrees through which this air has been heated, and c_p the specific heat of air under constant pressure.

If we substitute again in this expression the value of v taken from (3) we have

$$(7.) \quad Q = D_c c_p \sqrt{2gH \left(\frac{T_c - T_a}{T_a} \right)^3}$$

This expression represents the heat units expended in heating the air of the chimney to produce the velocity v in the chimney.

The heat furnished may be supplied by a furnace at the base of the chimney, the heated products of combustion from which mingle with the air which enters the base of the chimney; by a system of steam-pipes which heat the air by contact as it passes through or among them, or by any other mode which will accomplish the result. If a fire or furnace be employed, as in mines, in such a way that the dissipation or loss of heat from the furnace is prevented, the efficiency of the furnace may be considered unity.

Under this, the most favorable circumstance for the efficiency of the chimney, equation (7) gives the total heat generated and available.

In ventilation by a fan or blower driven by a steam-engine, the heat expended to produce the same velocity, or the same discharge and renewal of air, will depend on the efficiency of the steam-boiler and engine, the efficiency of the fan or blower, and the loss by friction in the apparatus.

If we consider the efficiency of the boiler and engine to be one-tenth, the efficiency of the fan five-tenths, and the loss from friction two-tenths, or the efficiency as regards friction eight-tenths, the resulting efficiency of the whole apparatus will be

$$E = .1 \times .5 \times .8 = .04 \text{ or } \frac{1}{25}.$$

The work performed by the heated chimney to produce the velocity v , and for each square foot of cross-section was found to be equation (5)

$$(8.) \quad \bar{W} = D_c \sqrt{2gH^3 \left(\frac{T_c - T_a}{T_a} \right)^3} \text{ in foot lbs.}$$

To produce the same work by a fan whose efficiency is $\frac{1}{25}$, twenty-five times this amount of work must be expended in equivalent heat units. Hence the number of heat units to be expended will be

$$(9.) \quad Q^1 = \frac{25}{772} D_c \sqrt{2gH^3 \left(\frac{T_c - T_a}{T_a} \right)^3},$$

the second member being divided by 772 to transform its value in foot lbs. to its value in heat units. The relative quantities of heat expended by the chimney and fan, or the relative efficiency under the conditions assumed will then be

$$(10.) \quad \frac{Q^1}{Q} = \frac{\frac{25}{772} D_c \sqrt{2gH^3 \left(\frac{T_c - T_a}{T_a} \right)^3}}{D_c c_p \sqrt{2gH \left(\frac{T_c - T_a}{T_a} \right)^3}}$$

$$\text{Or } \frac{Q^1}{Q} = \frac{25 H}{772. c_p T_a} = \frac{H}{7.35 T_a},$$

the value of c_p being 0.238.

If we suppose the temperature of the external air to be 60° F., the value of T_a will be 519.4, and

$$(11.) \quad \frac{Q^1}{Q} = \frac{H}{3817.59}.$$

This expression shows that the relative efficiency depends only on the height of the chimney, and in no way on the differences of temperatures within and without the chimney. For a chimney one hundred feet high, the efficiencies will be as 1 to 38.17; or,

$$Q^1 = \frac{Q}{38.17},$$

showing that the chimney requires an expenditure of heat thirty-eight times greater than the fan. For a chimney 500 feet high, the fan will be 7.6 more efficient.

If the chimney be heated by steam-pipes at its base, the efficiency of the boiler and pipes must be taken into consideration, making a result still more unfavorable for the chimney.

On the other hand, where small quantities of air are moved, requiring only a fraction of a horse-power, or one or two horse-powers, to drive a fan, these powers being produced by a small engine and boiler employed solely for this purpose, the efficiency of the mechanical apparatus would probably be much less than $\frac{1}{25}$, a condition of things unfavorable to the fan.

We may now inquire under what circumstances the chimney might be advantageously employed instead of the fan.

In all cases of moderate ventilation of rooms or buildings where as a condition of health or comfort the air must be heated before it enters the rooms, and spontaneous ventilation is produced by the passage of this heated air upwards through vertical flues, the efficiency of this mode of ventilation is evidently unity; that is to say, no special heat is required for ventilation; and if such ventilation be sufficient, the process is faultless as far as cost is concerned. This is a condition of things which may be realized in most dwelling-houses, and in many halls, school-rooms, and public buildings, provided inlet and outlet flues of ample cross section be provided, and the heated air be properly distributed.

If, starting from this condition of things, we suppose a more active ventilation to be demanded, but such as requires the smallest amount of power, the cost of this power, when the wages of a skilled mechanic are taken into account, may quite outweigh the advantages of the fan in fuel.

There are many cases in which steam pipes in the base of a chimney, requiring absolutely no care or attention, may be preferable to mechanical ventilation, on the ground of cost, and trouble of attendance, repairs, and maintenance.

There is quite a wide field for the employment of heated chimneys for ventilation before a limit is reached when the fan becomes indispensable, even when economy alone is considered; and this field becomes more extended, when convenience, saving of time, and personal care and attention influence a choice.

Ventilation by chimneys is disadvantageous under one point of view in any case—viz., the difficulty of accelerating the ventilation at will when large quantities of air are needed in emergencies.

The fan or blower possesses the advantage in this respect that by increasing the number of revolutions of the fan the head or pressure is increased, the law being that the total head produced is equal (in centrifugal fans) to twice the height due to the velocity of the extremities of the blades, or

$$H = \frac{v^2}{g}$$

approximately in practice.

In mines it is evident that to produce by a chimney the same ventilation as that produced by a fan with the same economy of fuel the up-cast shaft must be very deep. Taking into consideration the wages of an engineer employed to run a large fan and the cost of maintenance and repairs, it might happen, however, that a mine of moderate depth, where the galleries are large and the resistances consequently small, could be efficiently ventilated by a furnace and a chimney, at no greater expense than is required for the fan.

It is worth while to consider in this connection the rate at which the expenditure of heat increases in chimney ventilation when for the same channels of flow it is desir-

able to accelerate the velocity by increasing the heat of the chimney. Equation (3) gives the volume of flow per unit of section of the chimney, in terms of the height of the chimney and the interior and exterior temperatures. For the same height H , the volume of flow per second is proportional to the square root of the difference of temperatures.

Equation (7) gives the expenditure of heat for the same height H , and for the same difference of temperatures. The height H remaining constant, the expenditure of heat is proportional to the square root of the cube of the difference of temperatures.

The first formula is equivalent to the following:

$$V = C \sqrt{T_c - T_a},$$

and the second to

$$Q = C' \sqrt{(T_c - T_a)^3}$$

C and C' being constants.

If in these formulas we make $(T_c - T_a)$ successively 9, 16, 25, 36, 49, 64, 81, we have the following results:

Differences of Temperature.	Volumes.	Heat expended.
9°	C X 3	C' X 27
16°	C X 4	C' X 64
25°	C X 5	C' X 125
36°	C X 6	C' X 216
49°	C X 7	C' X 343
64°	C X 8	C' X 512
81°	C X 9	C' X 729

This shows that as the volume (or velocity) is increased by increasing the difference of temperature, the expenditure of heat increases as the cubes of the volumes.

Economy of heat requires, therefore, that the velocity shall be kept small and increase of volume obtained by enlarging the chimney and the channels or conduits through which the air passes. Moreover, since the resistances from friction diminish in rapid proportion as the channels are enlarged, and more of the total head produced by the chimney becomes available to create the velocity of flow, an additional advantage in large cross sections for the chimney and conduits is secured.

The same laws of expenditure of heat hold for the fan or blower, the expenditures of heat increasing for the same conduit as the cube of the velocity of flow. This is, in fact, a general law for all cases where work is performed under such circumstances that the resistances are proportional to the square of the velocity of motion. In such cases the resistance being ($R = C.V^2$) a constant multiplied by the square of the velocity, the work performed per second will be proportional to the cube of the velocity

$$\bar{W} = Rv = CV^3.$$

It often happens that for a particular chimney and channels of flow the ventilation becomes insufficient, and instead of increasing the heat in the chimney with a large additional expenditure of fuel, a fan is introduced to take the place of the chimney ventilation.

The relative efficiency

$$Q^1 = Q \frac{H_c}{3817.59}$$

and the application of this law of the proportion of heat expended to the velocity of discharge, enables us to ascertain to what limit such a substitution of a fan for a chimney may be carried before the cost of the fan exceeds the cost of the furnace ventilation.

In the above equation of efficiency, if the chimney is 100 feet high the fan will be 38 times more efficient than the chimney, and the table shows that the velocity of flow by the fan may be quadrupled before the cost exceeds that of the chimney. If the chimney is 200 feet high the fan will be 19 times more efficient than the chimney, and the velocity of flow may be increased to a little more than two and a half times that which was produced by the chimney before the cost by the fan exceeds that by the chimney. For a chimney 500 feet high the velocity by a substituted fan could hardly be made twice that produced by the chimney before the cost of the fan with increased ventilation should exceed that of the chimney. The question might then turn upon the advisability of getting the increase by additional heat in the chimney even with a large proportional additional expenditure of fuel; the cost of attending and maintaining the fan becoming an important element in the problem.

It is quite evident that for the fan as well as for the chimney low velocities and large conduits are favorable to economy.

The following records of experiments are furnished in connection with this paper as a contribution from Mr. George A. Suter, M. E., a graduate of the School of Mines, junior member of the society, and now engineer for the New York Exhaust-Ventilator Company.

The experiments were made by Mr. Suter with great care, the power of the engine driving the fan having been determined by the steam-engine indicator, and the volumes of air delivered having been carefully determined at the same time by an anemometer.

The fan employed was a Blackman fan, belonging to the class of disk fans, four feet diameter, and the experimental apparatus was so arranged that the air was drawn and forced alternately through a metallic tube 30 feet long and four feet diameter; the fan being mounted at one end of the tube.

In the first two sets of experiments the only resistance to the flow of the air was the frictional resistance of the tube and fan passages, and the resistance caused by the contracted vein at the entrance. In the second two sets the passage of the air was obstructed by a diaphragm of cheese-cloth placed within the tube; and this additional resistance was ascertained by a water-gauge in the usual way. The table of experiments is useful for determining the horse-power required for given volumes of air discharged with this class of fans, under free delivery and against resistances represented by the water-gauge readings of the table. For large volumes with free delivery, or with very small water-gauges, the efficiency and the small power required are worthy of attention. Estimating four and a half pounds of coal per horse-power per hour in common cases, with coal at five dollars per ton, a horse-power will cost as far as fuel is concerned about one cent per hour; the hire of a man to take care of and manage the apparatus, including other expenses, perhaps twenty-five cents per hour.

For such cases, and especially where the power required is only a small fraction of a horse-power as in ventilating single large rooms or small buildings, it is evident that as regards cost of fuel and the care and attention required, ventilation by a heated chimney is to be preferred. Where a fan is driven by machinery employed for other purposes than ventilation, the cost of attendance chargeable to ventilation being therefore trifling, the fan would evidently in all such cases be more appropriate. A variety of circumstances and conditions enter into these problems of ventilating single rooms or halls, and a choice can only be made through the exercise of the best judgment.

Under circumstances where hospitals or public buildings of considerable magnitude are to be ventilated, and especially where the activity of the ventilation must be varied occasionally, the fan is no doubt to be preferred. And this is quite sure to be the case when the vitiated air is drawn through several systems of collecting ducts from a series of large rooms, into one main outlet; the friction of such collecting conduits, and the resistances of bends and changes of direction in them becoming principal factors in the power consumed. In such cases a comparatively high velocity at the outlet is indispensable. A system of ventilation by means of heated chimneys in such cases involving no greater cost would require numerous and ample vertical heated flues so arranged in the construction of the building that the velocity in each flue should be the smallest possible, and the frictional resistances avoided by the most direct passages of the vitiated air to the heated chimneys. A thorough and proper distribution of the incoming fresh air would demand such a distribution, also that collecting ducts could be largely dispensed with; or if they were necessary, that they should be as short and as large in size as the conditions of least resistance might demand.

Such a system might, in many cases, be preferable to one involving the use of a fan even in large buildings, but unless such buildings have been designed with this plan in view, proper inlets for fresh air forming a part of the plan, it is difficult to apply it with success.

In nearly all public buildings of large size, which come under the head of old buildings in which the necessities of proper ventilation were originally neglected, the fan will probably be found to be the most efficient remedy for deficient ventilation.

Record of Experiments made with the Blackman Fan by Mr. George A. Suter, M. E., to determine the volumes of air delivered under various conditions, and the power required.

Revolutions per minute.	Cubic feet of air delivered per minute.	Horse-power.	Water-gauge. Inches.	Nature of the Experiments.
330	25797	0.65		Drawing air through 30 feet of 48-inch diameter pipe on inlet side of the fan.
440	32575	0.90		
534	41929	1.42		
628	47755	1.42		
340	20379	0.76		Forcing air through 30 feet of 48-inch diameter pipe on outlet side of the fan.
453	26660	1.00		
536	31649	1.86		
627	36543	2.47		
340	9983	1.22	0.28	Drawing air through 30 feet of 48-inch pipe on inlet side of the fan—the pipe being obstructed by a diaphragm of cheese-cloth.
430	13017	1.17	0.47	
534	17018	0.75	0.75	
570	18649	0.86	0.87	
330	8999	1.31	0.26	Forcing air through 30 feet of 48-inch pipe on outlet side of fan—the pipe being obstructed by a diaphragm of cheese-cloth.
437	10071	1.27	0.45	
526	11157	0.60	0.75	

PLEURO-PNEUMONIA, alleged to be due to diseased cows recently sold by the New York Infant Asylum, at East Chester, has appeared among the cows in New Rochelle township. The Board of Health has ordered an examination of all stables.

ENGLISH PLUMBING PRACTICE.

BY A JOURNEYMAN PLUMBER.

No. LVII.

(Continued from page 107.)

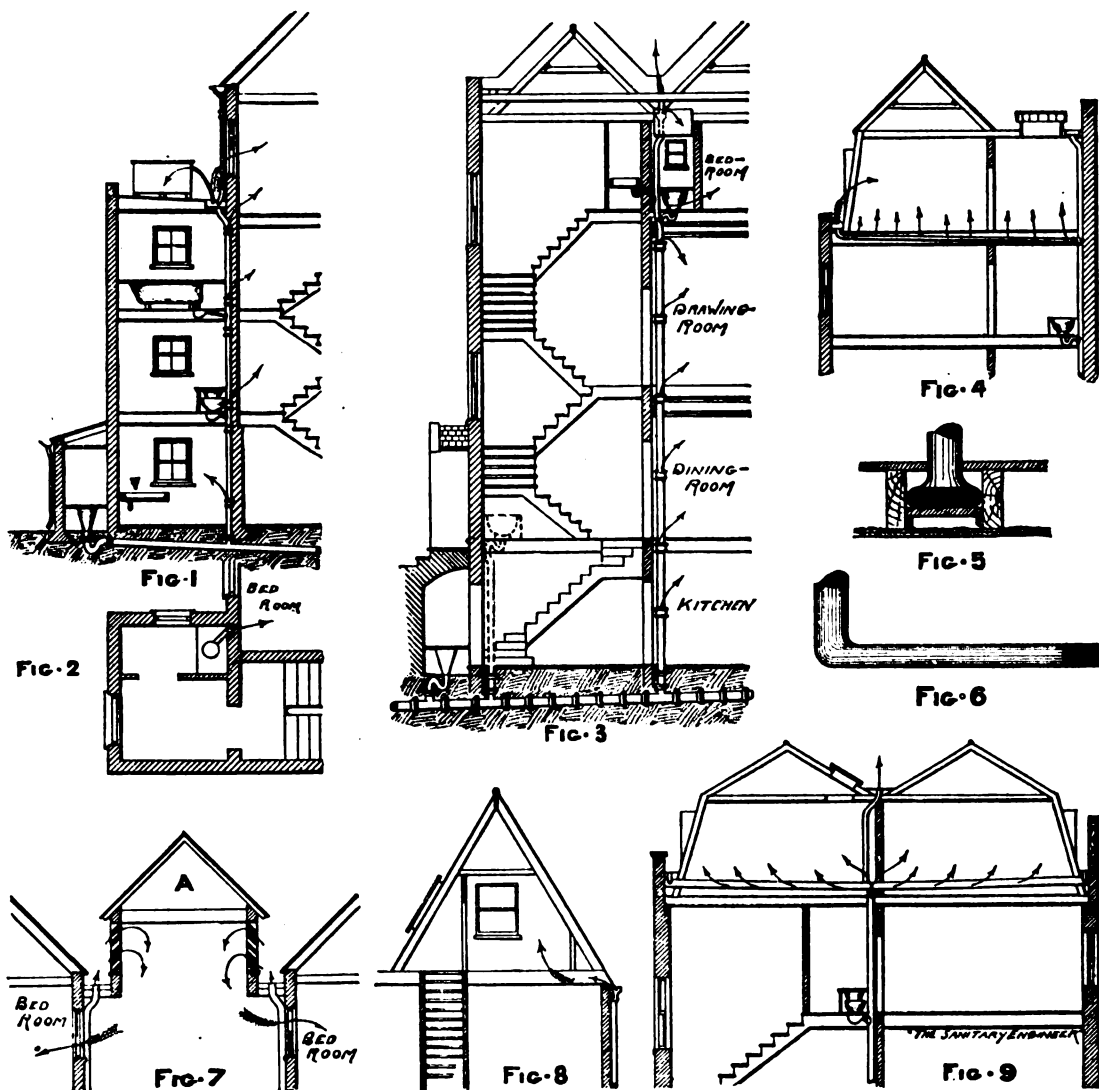
SOIL-PIPES (CONTINUED).

In the last paper were given a few instances, out of several hundred that could be given, of the way in which jerry builders fix soil-pipes on the external face of house-walls, and it was pointed out that, although the pipes were outside, they were dangerous to health by reason of their being so placed that any smells escaping from them could gain admittance to the house. It may be said that no cause for smells should be allowed, and then the air would not be polluted, and what escaped from the soil-pipes would be harmless. But it may generally be accepted as a fact, that if the working parts of a sanitary system that are in sight are defective, those parts not in view are far from what they should be. The reader is referred to the

joint of the pipes, and also through the wall into an adjoining bedroom. This will be more clearly understood by referring to Fig. 2, this being a plan of one water-closet, the arrow showing the way the smoke passed through the wall, which, at this point, was only about $4\frac{1}{2}$ inches thick. The mortar was very poor, and as the chase for the pipes had been cut after the house was built, the bricks were loose. The plaster on the walls was very much cracked, thus leaving little or nothing to act as a barrier against smells passing through.

The soil-pipe was continued to the small flat roof to receive the rain-water from that and also the upper roof. The overflow-pipe from the cistern was fixed so as to discharge into the top end of the soil-pipe.

Another class of house is shown in section at Fig. 3. In one case the writer had to alter the plumbing. The staircase was near the front of the house. One water-closet was on the second floor, and the soil-pipe from it was fixed inside the house in an angle of the drawing-room on the first floor and the dining-room on the ground floor. The pipes were of light iron and the joints defective. Each time the water-closet was used the noise of the water was dis-



numbers of THE SANITARY ENGINEER for October and November, 1884, to the articles on drains and traps, where the cause for smells from ventilation-pipes was discussed.

The writer has referred to memoranda, extending over a period of about eight years, of plumbing-work that he has had to alter, and finds notes of cases of illness arising from soil-pipes fixed as described in the last paper. The list includes three single, two double, and one case of three children being ill with diphtheria. In each case it was the above complaint, children that suffered, and the bedroom windows were close to the rain-water down-pipes leading into the soil-pipes. No doubt, if the evidence could be collected, there are hundreds of similar cases occurring every year, and yet this class of work is still allowed to be fixed, and no one interferes.

Enough has been written to show the danger of fixing light iron soil-pipes, with the rain-water leaders connected to them, on the outside of the house, but there remains to be told, the evils of fixing the same class of work inside the house.

Figure 1 is a very common example. One case was tested with a smoke-rocket, when smoke escaped from each

tinctly heard in the above rooms, so that it was deemed advisable to remove the whole affair to a less objectionable position and the soil-pipe fixed outside an external wall.

The writer has a job on hand at the present time where the soil-pipe is fixed outside the walls, but the water-closet is fixed over a drawing-room with a decorated ceiling. The space round the trap is packed with sawdust to deaden the sound of rushing water. The housemaids have been in the habit of bringing all bedroom slops to this water-closet, and, although the floor beneath the apparatus is partly covered with lead, water gets splashed over and the ceiling beneath is disfigured with stains. In spite of all protests as to the unsuitability of the position for a water-closet the owner insists on retaining it in its present place. This is in a house the rental of which is about £150 a year. There is not the least doubt the plaster of the ceiling below will become so loose that, should a pipe leak or water by any means get splashed over the water-closet safe, a large portion of the ceiling will fall down and perhaps do several pounds' worth of damage to furniture or whatever may be near, and then there will be another growl at the plumber who fixed the water-closet there.

There are several houses near Hyde Park, in London, that were built some twenty-five years ago that are very badly designed with regard to the sanitary arrangements. Figure 4 is a section across the two upper floors and roof of one house the writer had to make several alterations to some years ago. The soil-pipe was continued to the small flat roof next the party-wall of the next house. Beneath the floor of attic an open trough, made by lining between the floor-joists with lead, was made to carry away the water from the front gutter into the soil-pipe. In addition to the smells escaping out of the end of the trough and entering the attic window the floor-boards over the trough were so shrunken as to allow any smells to freely escape into the bedroom in which maidservants slept. The arrows denote this escape. The way this was improved was rather interesting. Space was made by the side of the soil-pipe to fix a new lead pipe to receive the rain-water from the small flat roof. The lead trough beneath the flooring was taken out, and as the space was only $2\frac{1}{2}$ inches deep, a 6-inch lead pipe was flattened, as shown in section, Fig. 5. Ten-foot lengths of pipe were used, which necessitated three joints being made when the pipes were in their position. This was gotten over by cutting open the pipes about eighteen inches each side of the joint, which was then soldered on the inside of the bottom and sides from A to A, Fig. 5. After doing this the pipe was closed and the other part of the joint wiped on the outside. A seam was then wiped over the slits, paper being pasted over the soldered joint at the sides of the seam to prevent that being melted. One end of the 6-inch pipe was bent upward, as shown by Fig. 6, and soldered into the bottom of the gutter, and the other end soldered into the vertical rain-water pipe fixed from the upper roof as predescribed.

Innumerable cases could be given of the evil of attaching rain-water leaders to soil-pipes. Figure 3, thirty-seventh paper on "English Plumbing Practice," is a plan of a house, one of the soil-pipes in which was used as a rain-water leader. The top end finished as shown in section, Fig. 7. A is a skylight over a staircase, and which also gave light to several bedrooms. The sides of the light were lowered for ventilation, but, unfortunately, the skylight was in a valley between two high roofs, and it did not matter which way the wind blew, there was always a draught into the house, carrying with it all smells that escaped from the combined rain-water and soil pipe. In this case a separate soil-pipe was fixed and continued to a good height above the roof as ventilation to drains and soil-pipe. At a country house near Maidenhead, taken by a lady and family for the summer months, the servants sat by their bedroom window the whole of the first and only night they were there, and could not stay in bed because of the abominable stench that appeared to be immediately beneath. On an examination being made it was discovered that the rain-water leader was connected to a drain leading into a cesspool, no trap of any kind being fixed to prevent smells escaping.

Figure 8 illustrates the evil. Smells escaping through the pipe passed under the eaves of the slates, between the floor-joists and through the joints of the boards beneath the bedstead.

One more illustration is given of defects of construction often met with in a certain class of London houses. In this case a servant-maid had fever, which led to an examination for the cause being instituted.

Figure 9 is a fragmental section of the third and attic floors of the house. The soil-pipe, which was of lead, with good soldered joints, was connected at the top with a leaden gutter as shown at E. The attic rooms were used for sleeping in, and the above gutter was continued through each attic to receive the water from the roofs at F F. The only protection to prevent smells passing into these bedrooms was a board loosely laid over the trough gutter. In addition to this abominable state of things, appearances lead one to think that at times this board had been removed so that bedroom slops could be emptied down and thus add to the already insanitary state of things.

(TO BE CONTINUED.)

Correspondence.

THE KANSAS CITY EXCHANGE BUILDING COMPETITION.

NEW YORK, July 23, 1886.

SIR: The announcement of the result of the Kansas City Exchange Building Competition as appearing in your issue of the 22d inst., included the name of "Watson &

Tuckerman, of New York," as the authors of one of the first five selected designs.

Will you kindly credit the authorship in your next issue to Messrs. Weston & Tuckerman, who constitute the firm intended to be designated.

Your journal is so universally quoted through the country, that we fear the error may be extensively distributed, unless the correction is promptly made.

We beg to remain, dear sir, your obedient servants,
WESTON & TUCKERMAN.

SIZE OF PIPE FOR DRAINING SIX HUNDRED ACRES.

NORWICH, CONN., July 16, 1886.

SIR: Are the figures correct in the statement on page 154, that an area of 600 acres was drained by a 12-inch sewer with $\frac{1}{8}$ fall per 100, and, if not, what should they have been? C. E. CHANDLER.

[The figures referred to should read feet instead of inches. A 12-foot diameter sewer has an area of about 113 square feet, and to drain one cubic foot per second per acre on 600 acres would require an average velocity of $5\frac{1}{8}$ feet per second. To drain $3\frac{1}{8}$ inches depth in 40 minutes from same area would require nearly five times this velocity. Whether the water reached the sewer at this rate at any time is a matter of uncertainty; but the sewer would not discharge the quantity reaching it.]

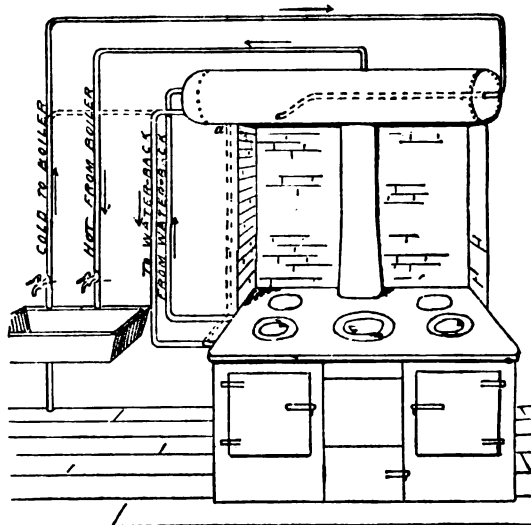
PLACING AN ORDINARY KITCHEN-BOILER IN A HORIZONTAL POSITION.

TRENTON, N. J., July 19, 1886.

SIR: A party in Trenton is going to have hot and cold water in his house, but he has not much room in his kitchen, and the only place he can put the boiler is over the top of the range, with only eighteen inches of room between the top of range and ceiling, as shown in diagram. The boiler is a plain 35-gallon one. Will you please let me know through your paper if it will work, or if there is another way to fit it up, and oblige, Yours truly,
PLUMBER.

[There is nothing unusual in suspending a boiler horizontally above a range, and in either "Plumbing Problems," page 203, or in THE SANITARY ENGINEER of December 24, 1885, may be found two very well-arranged sets of horizontal boilers in connection with ranges.

With the arrangement you show in the diagram you send (the accompanying figure) the circulation will be



rather feeble. This may be improved somewhat by putting a "spud" on the boiler at *a*, taking the return circulation back to the water-back in that manner, as shown by the dotted lines. Then the cold water to the boiler can be fed into it through the usual connection, as shown at *b*, instead of into what is usually the bottom spud, as you show. The inside cold-water pipe will then be in its usual place, or it may be dispensed with, possibly to advantage, as then the cold water will not be admitted so near the point of outlet. In the pipe *b* a stop and check should be used, the latter to prevent hot water from being drawn through the cold pipe at sink, which might follow under some conditions. In a galvanized-iron boiler an extra "spud" can be attached by tapping. Drill a three-quarter hole and expand or open it with a drift-pin until the three-quarter pipe-tap will enter. This will thicken the edge of the hole sufficiently in the thin iron to get two or three good turns of the thread.]

SIZE OF STEAM-BOILER TO HEAT A CERTAIN BUILDING.

LANCASTER, PA., July 17, 1886.

SIR: Please let me know how many horse-power of boiler is sufficient to heat 313,774 cubic feet of space in a building. Also how much radiating-surface will it require to heat same building—free from all other buildings—it being the Lancaster Court-House, built of sandstone. Oblige,
L. H. B.

[About a 40-horse power boiler and a heating-surface of from 4,500 to 5,500 square feet, depending on how it is used.

This is only an approximation of what would probably be required, and should not be used as a basis on which to criticise the work of others, or as a guide to base an estimate or do work by. If particulars are sent we will give further information.]

QUANTITY OF AIR WARMED BY GIVEN HEATING SURFACE.

HONESDALE, PA., July 15, 1886.

SIR: Will you please tell me where I can find the amount of heat which is given off by radiation or convection from a given surface of steam-pipes at a given pressure of steam? For example, given the air at zero, steam-pressure five pounds, how much air will one square foot of surface raise to 70° Fah. per minute? We wish to ventilate our school buildings, and would like as much information as possible on the subject. Any information on the foregoing, therefore, that you can give us will be appreciated. Yours truly,
R. BURNS.

[Experiments by Mr. F. W. Wright, of New York, on a one-inch pipe box-coil, six pipes wide and eight pipes high, rated as forty-nine square feet of surface, showed a condensation of .44 of a pound of water per square foot of surface, with a steam-pressure of five pounds, when the incoming air was 22° above zero and the air as it passed the register 133°. The heat of vaporization in this case being 953 heat-units per pound weight of steam condensed, it stands that the units of heat lost per foot of surface was 419.3, or about 2.8 units of heat per square foot of surface for each degree that the mean temperature of the air is less than the temperature of the coil. Experiments by the same person with a Walworth indirect radiator four pipes high and twelve pipes wide (staggered), with the air entering the box at 64° and leaving it at 139°, with other conditions nearly the same as in the first case, gave a condensation equal to 2.35 heat-units per square foot of surface per hour for each degree difference between the mean temperature of the air and the temperature of the pipe. Experiments by Mr. George H. Barrus, of Boston, on vertical wrought-iron tube radiators of about thirty inches length of tube, show that the condensation or units of heat given off is between 2 and 2.35 heat-units, with air at about 60° Fah. coming freely in contact with the surface of the pipes.

We wish to point out here, however, that it must not be taken that a square foot of the Walworth indirect heater is not capable of doing equal duty with a square foot of common box-coil, as it will, presumably, do better under like conditions, the difference of .35 of a heat-unit being accounted for by the difference of the initial temperatures of the air at which the experiments were made, and, presumably, different velocities of currents; so that all this simply goes to prove that the loss of heat, therefore, from plain pipes is somewhere between 2 and 3 heat-units per square foot per degree of difference between the air and the surface of the pipe, and that it is greater for greater differences of temperature, and that the units we give should, and will, probably, cover all reasonable ranges of practice—say between zero and 60° Fah., the condensation being represented by 3 heat-units at zero, and by 2 heat-units at 60° Fah., with different results between with properly arranged apparatus. This, of course, only places it approximately, and is given because there is nothing specially authoritative on the subject.

With regard to the units of heat taken up by the air, though, there is no question, and the amount of steam required can be determined accurately although the radiating-surface cannot. This latter, however, should be in excess sufficiently to place you on the safe side, and an arrangement should be made with mixing-dampers whereby the exact amount of heat required can be extracted from the coils; or, in other words, let the coil be ample for all conditions and provide a means of regulating the temperature of the air by passing it through the coils or over the coils, or partly through and partly over them, mixing the currents beyond the coil on their way to the room.

A school building should receive about 1,000 cubic feet of fresh air per child per hour. For fifty children in a room, then, it will require 50,000 cubic feet of fresh air per hour. Fifty thousand (50,000) multiplied by the difference between the temperature of the room and the temperature of the air outside, divided by a constant of $\frac{1}{5}$, will give the units of heat that the air should receive to raise it to the inside temperature, and this divided again by 953 will give the pounds weight of steam required at five pounds pressure.

$$\frac{\text{cub. ft.}}{50} \times 70^\circ = 70,000$$

heat-units per hour, and

$$\frac{\text{H. U.}}{953} = 73.5$$

pounds weight of steam per hour that will be condensed at five pounds pressure. Of course, it is understood that steam condensed is equivalent to water evaporated, and, therefore, the water to be evaporated for each such room in an hour under such circumstances will be 73.5. This is not the average for a year, but for the day, and should 35° above zero be the average for a winter, then $36\frac{3}{4}$ pounds weight of steam will be required per hour for the season.

Heating surface, however, should be provided for the coldest weather, and when the condensation is established at 73.5 the square feet of heating-surface should not be fixed at less than *three* times as much, or 220 square feet, which is an empirical rule based on the condensation of one-third of a pound of water per hour for each square foot of surface of radiator.]

ENFORCING THE PLUMBING LAW IN PHILADELPHIA.

(From our Regular Correspondent.)

PHILADELPHIA, July 23, 1886.

THE Board of Health is keeping on vigorously with the inspection of the plumbing-work of the city, and is bending its exertions to fully covering the entire city. The ordinance of councils provides for the appointment of four inspectors and one chief inspector, but the board thinks this small force is incompetent to cope with the work, and so, from next Monday, the force will consist of a chief and six inspectors, and even with this force it looks as if the new department will not be able to cope with its work. Since the opening of the department nearly 1,600 plans have been approved by the chief and filed in the board for reference to when the work is inspected in the near future.

Many of the plans as presented are most crude, and fully demonstrate the necessity for a department of supervision. The efforts of the inspectors so far have been to so instruct the plumbers that they will better comprehend the requirements of the regulations. A number of cases have been found where the plans have been sent in by the plumber, and then approved and filed, and at their completion the inspection has disclosed the fact that the work had not been done in accordance with the approved plan; in all such cases the plumber has been compelled to tear out the work and do it in accordance with his plans.

The owners of large constructions in the city are becoming much interested in the inspection, and cases where they refused to pay the builder until he produced the certificate of the inspectors that the plumbing-work has been approved have come to the notice of the inspectors. As yet no flagrant violation has been found which called for the prosecution of the parties, but it is becoming more apparent that the inspection is having a very beneficial influence in stopping the tendency to skin jobs and do inferior work, and teach the people the necessity of good honest plumbing-work in their houses.

If "A Reader," of Newark, N. J., will send us his name and address we will try to answer his question about keeping a cellar dry.

A PLUMBER ARRESTED FOR DOING BAD WORK.

ON the charge of doing recklessly bad plumbing-work in a house on Sixth Avenue, Bernard Byrnes, a master plumber of this city, was arraigned in the Jefferson Market Police Court on Monday. Mr. L. M. Hooper, Inspector

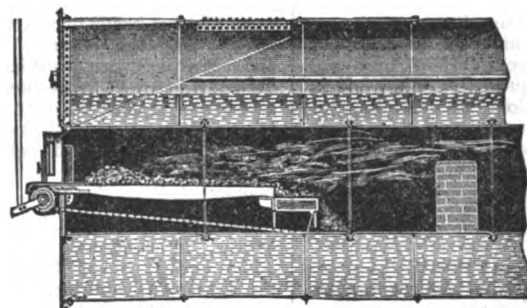
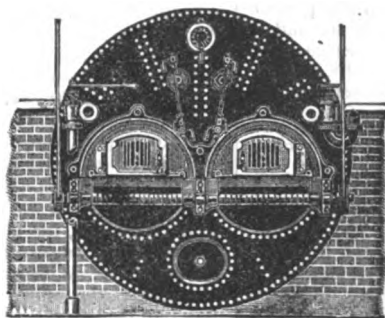
of Plumbing in the Health Department, who made the complaint, accused Byrnes of laying an iron drain in the cellar without calking the joints, and then covering in the drain to prevent the inspector from discovering the bad work. Byrnes has been held for trial in \$300 bail.

Novelties.

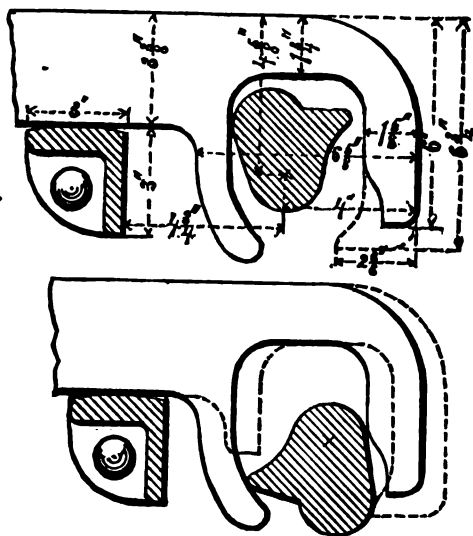
Under this heading we propose to describe and illustrate appliances of probable interest to our several classes of readers. The selection will be made without reference to the wishes of agents or patentees, being governed solely by considerations of novelty, ingenuity, and probable interest to readers, and especially the fact that they have not been elsewhere described. As a rule we shall make no comments, and it is to be distinctly understood that a notice does not imply approval. No charge will be made for these notices, and any offer of pay for their insertion will insure their omission. We shall be glad to have our attention called to novelties suitable for this section.

McDOUGALL'S SELF-ACTING GRATE-BARS.

THE apparatus consists of a special furnace-door of neat design, to which is appended a cam-shaft, as seen in Figs. 1 and 2, for the purpose of moving the fire-bars backward and forward. The bars, although they move in altogether, do not come out altogether; but every alternate bar is drawn out first and is followed by the intermediate ones; the effect of this is that a movement is given to the coals in the forward direction and the clinkers are ultimately carried over the bridge. Another advantage of the system is that



FIGS. 1 AND 2.



FIGS. 3 AND 4.

the bars in sliding over each other every time they come out are self-cleaning, and thus prevent the formation of clinkers between their sides with a stoppage of the air-spaces. The bridge is specially designed so that the clinkers when cool can be withdrawn from the ash-pit at pleasure without opening the furnace-door; this can be seen from Fig. 2. The method of firing is as follows: After obtaining a uniform fire over the entire grate-surface, the bars which are actuated by the cam, seen more distinctly in Figs. 3 and 4, are set in motion. The fireman must now throw the whole of the coal on that portion

of the bars immediately in front of the furnace; the smoke made by the ignition of this coal is burnt when passing over the intensely hot fire behind. When the first charge has been ignited and well advanced on the bars, a fresh charge is added same as before, and the operation repeated continuously; the clinkers and ash are carried over the bridge and deposited on the bottom of the tube, whence they can be drawn at will. To understand the method of working the bars, it will be necessary to look at Figs. 3 and 4. Figure 3 shows the bars drawn out and on the point of being moved inward altogether by means of the cam, which revolves slowly around the centre marked with a cross.

The special feature of the arrangement is in the manner of working the fire-bars. Every alternate bar has a long projection on the inside and a short one on the outside, the intermediate bars having short projections on the inside and long ones on the outside, as shown in Fig. 4, which represents two bars, one dotted and the other in full. As the cam works its way round it comes into contact with half the number of bars only, the other half being kept back for a time by the sharp projection shown to the left of the cam in Fig. 4; it is thus seen that the bars are pushed inward altogether, but are brought back half the number at a time.

It is the invention of Mr. McDougall, of the Chadderton Iron-Works Company, Limited, near Manchester, England, who are the sole makers.—*The Mechanical World.*

NOTES.

THE Ladies' Health Protective Association of this city keeps hard at work attacking what its members think are nuisances. At present it is after the Park Commissioners for keeping large heaps of manure where they cause offence to residents near Central Park. The commissioners say they are distributing the material as rapidly as possible, but the ladies propose to hurry them up.

THE nuisance created by dumping refuse matters and by the entrance of various filth into the Milwaukee and Menomonee Rivers has become unbearable. The brewery on the Menomonee is said to be chiefly responsible, and a peremptory order has been served on the proprietor by the Health Officer of Milwaukee to refrain from turning any noxious matters into the stream. The brewer has attempted to shift the responsibility upon certain slaughter-houses, and the whole business is to come before City Council. It seems to be feared that the nuisance will be as long lived, as those in our vicinity, on Newtown Creek, have proved to be.

WHILE workmen were making water-connections in the yard of a house in Rose Street in this city a few days ago, they came upon the skeleton of a man, whom tradition in that neighborhood says was murdered in an Italian boarding-house kept there twenty-eight years ago.

THE inland revenue officers at Montreal have lodged information against four dealers of the city for adulteration of coffee. In one case 75 per cent. of foreign matter was discovered. The Government analyst is at work and it is thought that many other cases of adulteration will shortly be entered.

DISPATCHES in the Associated Press give the following account of the cause and progress of an epidemic of typhoid fever in Waterford, Racine County, Wis., a small village away from all railroads: "Four weeks ago Barney Huening, a young man who had been working in Milwaukee, returned to his home at Waterford to recuperate from an attack of typhoid fever. Shortly after his return his little sister fell sick, but continued to visit the Catholic parochial school. Her parents did not know that she had caught the malady from her brother, who was rapidly recovering. Investigation showed that the water which he had used for bathing purposes had been carelessly thrown into the yard, thence finding its way into the well, which was used for drinking purposes by the children attending the Catholic school. The result was that a number of the children fell sick. The schools were closed, and all the patients, thirty-five in number, were isolated. A few deaths followed, and more are expected hourly. The section of the country is aroused, and at Waterford all business has been practically suspended. A number of families have fled, and others will follow."

Association News.

CHICAGO MASTER PLUMBERS—REPORT ON THE APPRENTICESHIP SYSTEM.

THE association met July 21, President T. C. Boyd in the chair. Committees for the year were appointed, with chairmen, as follows: Sanitary Committee, C. J. Brooks; Arbitration, Patrick Nacey; Auditing, William Sims; License, D. J. Rock; Legislative, M. Ryan; Apprentice, David Whitford, J. J. Hamblin, Joint Chairmen; Conference, J. S. Bassett; Library, William Gay; Warehouse, Robert Griffith; Exhibit, Andrew Young. As a new member, George Bigden, of Oak Park, paid \$10.

The following interesting report from the Apprentice Committee was submitted by David Whitford, Chairman, his associates being D. J. Rock and James Roche:

"On October 1, I sent to every member of our association a circular letter clearly stating the system we had adopted for the regulation of the apprentices. I also sent a blank requesting every member of the association to fill out and return to me with the name of all the apprentices in their employ. Out of a total membership of 140 master plumbers I received 36 answers containing the names of 171 apprentices, leaving 104 members still to be heard from. All should have responded cheerfully. We have had three interesting and instructive lectures, with an average attendance of seventy-five apprentices, by J. J. Hamblin, A. W. Murray, and M. Moylan. The result has been the forming of an intellectual training-school, with our library open to the boys. We have been able to settle several grievances between master and master, and master and apprentice, which would never have been settled in any other way more justly to all concerned. A great many of the apprentices have called on me during the year to get a certificate of the time they had been at the trade, thinking that if they had that they would be able to procure a job anywhere. In almost every case when I asked for their discharge from their former employer they had none. They left because they wanted more pay, or on account of labor troubles. This, as it appears to us, is conclusive evidence that we have a good scheme for the regulation of our apprentices. It is equally just for the apprentice as well as for the master. If you wish to make these facts which we have presented to you operative and to cover the entire city, we would urge upon you all the necessity of giving your next apprentice committee a good 'send off' by furnishing them anew with all the names of your apprentices. We would suggest that all apprentices coming to this city from foreign lands, who have been three years and over at the trade, be required to serve one year in addition to the five that they would have to serve had they commenced their trade here. In conclusion, educate the apprentices, teaching them to observe all things whatsoever you command them. The day was when ignorance might be winked at; it will not do for our day and the rising generation of plumbers. Wisdom and knowledge rightly directed in the hands of a plumber ought to be and must be paid for according to its worth. From the Atlantic to the Pacific, all over our land, cities and towns are springing up where they will need plumbers, men who will have to know their trade and be able to drive usurpers from the field and lay claim to that which is their own."

The recommendation about foreign-born apprentices was approved, though without formality of action.

Surrendering the chair to Vice-President John Griffith, Mr. Thomas C. Boyd presented his resignation as President. "I told you at the time that you re-elected me that I would hand in my resignation soon after the Deer Park Convention." Without egotism he could say he had served the association, if not with any great brilliancy, with honest purpose, and very kindly he thanked them for the way they had upheld him. Martin Moylan moved that the resignation be not accepted. "The coming year is going to be a very trying year—very trying—and we want a tried and good man—Tom Boyd." Thomas again objected: "To be plain with you, I cannot afford to give you the time I gave last year. As an Executive Committeeman, the National Convention, which meets next in Chicago, will probably require two or three weeks of my time. You are in good working shape, your committees well and willingly manned, your treasury not poor, the outlook prosperous, the association altogether in first-class running order, and you have plenty

of good timber for my successor—elect him." J. S. Beaver objected, as did others, more or less outspokenly. President Boyd: "On only one condition will I not adhere to my absolute declination—that I can call liberally on the vice-presidents." And the result of the matter was that his resignation was laid on the table unanimously. Voice: "Put it under the table." (Laughter.)

PITTSBURG, PA.—Prominent architects have signed a paper to the effect that they are willing to form an association, and there is no doubt that an organization will be effected soon.

NEW YORK MASTER PLUMBERS.—At the meeting of July 23 it was reported that a communication had been received from the president of the Journeymen's Association promising speedy action on the propositions presented to the journeymen by the Masters' Conference Committee. George C. Trede, of Tenth Avenue, was elected a member of the association.

PERSONAL.

DR. O. W. WIGHT has resigned his position as Health Officer of Detroit, Mich., to take effect July 31.

MR. JULIUS W. ADAMS has presented his resignation as consulting engineer to the Department of Public Works of this city, to take effect August 1. We have not learned the reason for this unexpected step on the part of Col. Adams. It would be difficult to find a person who, by reputation and experience, is so well fitted for the position, and we regret that the city is to lose his valuable services.

MR. ALPHONSE FTELEY, executive engineer of the new aqueduct commission of this city, has been appointed consulting engineer to succeed Mr. Joseph W. Davis, with leave of absence until his health is fully restored. Mr. Fteley, we are glad to know, is steadily regaining health and strength after nearly a year's illness. Mr. Davis's resignation carries out a purpose he has entertained for some time, but his withdrawal from the aqueduct work has been delayed until now by the refusal of the Aqueduct Commission to accept his resignation. Mr. Davis has fully earned rest from active work, and we trust it may result in a perfect restoration of his health, which has been somewhat impaired by his long and active labors. The Aqueduct Commissioners have shown their wisdom in retaining his services as long as they could, and they are to be equally commended in that they have retained Mr. Fteley, whose ideas from long association are in entire harmony with those of Mr. Davis.

MR. HUBERT O. THOMPSON, lately Commissioner of the Department of Public Works of this city, was found dead in his bed last Monday morning. The immediate cause was cerebral apoplexy, though he had been unwell for some time. Mr. Thompson was commissioner from December, 1880, to December, 1884. During his term of office, in the fall of 1883, the Department was made the subject of bitter attacks on the ground of alleged frauds in the letting of contracts, but Mr. Thompson prepared an answer so complete as to satisfy reasonable men that, whatever his record as a politician might be, he was not guilty of dishonest administration of this great department of city affairs. The reputation for ability which he leaves will be almost entirely that of a "County Democrat" and irreconcilable opponent of Tammany Democracy and the late Mr. John Kelly, Tammany leader.

Notes.

For works for which proposals are requested, see also the "Proposal Column," pages 197 and 198.

CONSTRUCTION.

TORONTO, ONT.—The advertisement for applicants to the place of Consulting Engineer and "Commissioner of Public Works and Health," does not seem to have been a successful method of obtaining an engineer of high repute, for on July 22 the Executive Committee of the City Council reported as below on the result: "In response to the advertisement twenty-one applications were received from parties residing in Canada, England, and the United States. These applications, with accompanying testimonials, were severally read and thoroughly considered at two special, but for obvious reasons private, meetings, and although among the applicants there were many engineers of high professional eminence, the majority having had large experience in

railway engineering, none of them seemed to be possessed of sufficient experience in the construction of the extensive municipal works required and contemplated for a large and growing city like Toronto. Your committee, therefore, taking into consideration the works required and contemplated as aforesaid, beg to report that none of the applicants came up, in their judgment, to the standard expected, which is disappointing in view of the salary offered, and the precautions taken to advertise so widely. Your committee, therefore, deem it inadvisable at this time to recommend an appointment from among the present applicants, but hope to be in a position to make a recommendation to the Council at an early day." The committee's report was adopted by council.

PLANS WANTED.—In our "Proposal Column" will be found an advertisement of the Mayor of Hoboken, N. J., inviting competitive plans for a new school building, for which three prizes are offered.

PITTSBURG, PA.—Twenty architects are making competitive plans for a gate lodge for the Allegheny County Cemetery, to cost upward of \$80,000. The name of the successful architect will be announced August 6.

ALLEGHENY, PA.—Messrs. George B. Post, of New York; H. G. Isaacs, of St. Louis; and J. W. McLaughlin, of Cincinnati; are among the architects specially invited to make competitive designs for the \$250,000 library building, the money for which was donated by Mr. Andrew Carnegie.

Some time ago Andrew Carnegie donated \$250,000 for a public library, which will be erected at an early day. Four Eastern architects and one Western have been specially invited to prepare competing designs, and a general invitation extended to the profession at large.

ANSONIA, CONN.—The town will construct an outfall sewer, for which proposals will be received until August 2, by the Committee on Sewers (J. M. Wheeler, William Powe, John Lindley), at the office of the Warden of the Borough in Ansonia. The engineer's estimate of the work to be done is as follows—viz.: 3,330 lineal feet of single-course 24-inch circular brick sewer, eleven manholes, and two wells five feet inside diameter, one on each side of the Naugatuck River. Also the laying of 500 feet of light cast-iron pipe across said river between wells. The proposal for laying the cast-iron pipe must be distinct from the other bids, and the proposal must specify "proposals for laying 500 feet of light cast-iron pipe, twenty-four inches in diameter, across the Naugatuck River."

ANNAPOLIS, MD.—The Board of Public Works, in conjunction with Chief Judge Alvey and J. Shaaff Stockett, representing the Library Committee, on July 15 selected Mr. Jackson G. Gott, of Baltimore, architect to superintend the building of the annex to the State House. The architect is to be paid five per cent. commissions on the cost of the annex. Governor Lloyd is chairman of the Building Committee.

ANDOVER, MASS.—In our Proposal Column will be found an abstract of proposals for furnishing cast-iron water-pipe, gates, hydrants, etc., to the Water Committee of Andover, Mass. J. L. Smith is chairman.

BOULDER, CAL.—This place held an election July 26, on the question of enlarging the water-works, at a cost of about \$59,000.

MEMPHIS, TENN.—The water question is now very actively discussed. The committee appointed to consider the relation of the city to the (old) Memphis Water Company, reported under date of July 12, recommending that the city entertain a proposition from the water company either for the sale of its plant to the city or for a new contract to furnish a more abundant supply. At the same time the (new) Citizens' Water Company, Samuel R. Bullock, of New York City, President, presented a petition to the City Council, dated July 14, asking that action on the proposition to buy the old water-works be deferred until the Citizens' Water Company can prepare a definite proposition looking to the building of works and the furnishing of a water-supply, and Samuel R. Bullock & Co., of New York, under date of May 5, offer to the Citizens' Company to make surveys and prepare specifications for the building of works as the basis of a proposition to the city. The City Council, at its meeting of July 22, had all the matter before it and decided to give the attorneys of the Citizens' Water Company, Messrs. Hill & Wilkerson, until August 15, to prepare a proposition. The Chairman of the

Memphis Committee is William M. Farrington. The President of the Memphis Water Company is Judge T. J. Latham.

MALDEN, MASS.—The Aldermen, July 20, passed an order authorizing the issue of \$25,000 water-bonds, for laying of new water-mains or extension of water-works at Spot Pond. The order was after passed by the other branch of the city legislature, and goes to Mayor Coggan.

WATERBURY, CONN.—The Water Commissioners have reported to the Aldermen that the time has come when energetic measures must be taken to provide a more abundant supply of water.

CHATHAM, W. VA.—The town wants some capitalist to build water-works. It will cost about \$5,000 to construct the works. Address W. L. Overbey.

ELGIN, ILL.—Messrs. Goodhue & Birnie, of Springfield, Mass., have proposed to the City Council to build a system of water-works in consideration of the granting of a franchise to them on the following terms: They will erect a plant on the direct-pressure and stand-pipe system, with a pumping capacity of 15,000,000 gallons daily. Water shall be supplied to the city at the rate of \$45 per hydrant annually, reckoning thirteen hydrants to the mile of main pipes laid. To private consumers the charge shall be according to an elaborate schedule prepared and made a part of the proposal by the contractors. The city shall have the right to purchase the works after ten years.

ORANGE, N. J.—The Board of Trustees of South Orange are agitating the project of uniting South Orange, Montrose, and the southern part of Orange in obtaining a new water-supply, independent of that now furnished to Orange. The plan now favored is the sinking of driven wells in the eastern end of the township.

KEARNEY, NEB.—The Kearney Water Company has been incorporated by J. P. Hartman, Jr., C. E. Hansom, H. Fred Wiley, and C. F. McLain. The council is considering a proposition from the Kearney Canal and Water-Supply Company to construct a system of water-works.

DENVER, COL.—On July 17 Mr. H. C. Lowrie, City Engineer, made a report to the Mayor and Council on the cost of changing the channel of Cherry Creek over to Sand Creek, east of the city. He estimates as follows: For right of way, \$35,000; slag and brush protection with backing, \$30,000; excavation, \$300,000; bridging, \$3,000; incidentals, \$25,000; total, \$393,000. The report was referred to the special committee having the matter in charge.

TROY, N. Y.—The City Attorney has been directed to prepare a resolution, to be submitted to the Common Council, looking to the building of a sewer from the city line south to Middleburgh Street, in order to carry out the recommendations of the State Board of Health with reference to the Piscawan Creek nuisance.

PHILADELPHIA, PA.—The Board of Trustees of the State Hospital for the Insane at Norristown on July 23 annulled the contract with Esaias Ginrich, of Lebanon, for the erection of four brick buildings at \$91,150. Wilson Brothers & Co. are the architects. It is now understood the work will be done by the day.

SPARTANBURG, S. C.—The City Council has contracted with the American Water-Works and Guarantee Company to build water-works. The city is to have sixty plugs for fire-protection, two public watering places, and a fountain on the public square, for which they are to pay an annual rental of \$2,500 for twenty years, with the privilege of buying the works after fifteen years.

HAMILTON, ONT.—On July 22 the Water-Works Committee opened bids for pumping-engines with a capacity of 8,000,000 gallons daily, as follows:

McKechnie & Bertram, Dundas, Ont., piston speed 240 feet per minute, steam-pressure in boiler 125 pounds, price, \$49,000.

Osborne & Killey, Hamilton, Ont., piston speed 218 feet, steam-pressure 100 to 110 pounds price, \$53,000.

H. R. Worthington, New York, piston speed 100 feet, steam-pressure 92 to 100 pounds, price, \$74,000.

George F. Blake, Boston, piston speed 250 feet, steam-pressure 125 pounds, price, \$68,450.

Holly Manufacturing Co., Lockport, N. Y., piston speed 200 feet, steam-pressure 100

pounds, price, \$49,000, for a pumping-engine of 100,000,000 duty.

Holly Manufacturing Co., Lockport, N. Y., piston speed 125 feet, steam-pressure 80 pounds, price \$59,000 for 105,000,000 duty.

The duty of all, except Holly 2d, is 100,000,000. At going to press the contract had not been awarded.

CHICAGO, ILL.—A \$30,000 contract for cast-iron water-pipe is given by the city to the Shickle, Harrison & Howard Iron Co., of St. Louis, prices being for 6-inch pipe, \$31.50; 8-inch, \$30.50; 12 to 16 inch, \$29.50; 24-inch, \$29. Other competitors were the Ohio Pipe Co., Columbus; Dennis, Long & Co.; Cincinnati & Newport Iron Pipe Co., Newport; McNeal Pipe Foundry Co., Burlington, N. J.

A contract is awarded for a steel bridge at Twelfth Street for \$41,159, to the Chicago Forge & Bolt Co., as against the following higher bidders: Keystone Bridge Co., Pittsburgh; King Iron Bridge & Mfg Co., Buffalo; Detroit Bridge & Iron Works; Passaic Rolling Mill Co.; A. H. Wolff, Chicago; A. Gottlieb & Co., Chicago.

Contracts are let for two engine-houses: One on Thirty-third Court, near Ashland Avenue, to D. H. Hayes & Bro., for \$9,743, and the other at Warren and Staunton Avenues to Joseph Downey, for \$10,480.

A city contract for 100 tons of pig-lead at \$4.74½ per 100 pounds is awarded to J. N. Raymond & Co.

The North Chicago City Railway Company is given the right to lay a cable through LaSalle Street Tunnel, connecting with the south division of the city, the principal conditions being that it shall build two good bridges at Clare and Wells Streets.

ERIE CANAL.—The New York State Legislature, at its last session, appropriated \$200,000 for enlargement of five locks on the canal. On July 15 the Superintendent of Public Works awarded contracts as follows: To Hughes Bros., of Syracuse, for the work on lock No. 47 at \$21,435, lock 48 at \$21,301.50, and lock 49 at \$16,879; to J. J. McLean, of New York, for the work on lock No. 51 at \$18,380, and lock No. 52 at \$24,755.50. The bids for the Oswego locks will be opened August 2.

WASHINGTON, D. C.—Otis Bros. & Co. have been awarded the contract for altering the Washington Monument elevator to adopt it to carry passengers; amount \$2,740.

BOOKS AND PAMPHLETS RECEIVED.

FIFTH ANNUAL REPORT OF THE STATE BOARD OF HEALTH OF NEW YORK. Transmitted to the Governor, April 9, 1886. pp. 483. With maps and plates. Weed, Parsons & Company, 1886.

FOURTH ANNUAL REPORT OF THE PROVINCIAL BOARD OF HEALTH OF ONTARIO, for the year 1885. Printed by order of the Legislative Assembly, Toronto, 1886. pp. 160.

HYDRAULICS: The flow of water through orifices, over weirs, and through open conduits and pipes. By Hamilton Smith, Jr., M. Am. Soc. C. E. New York: John Wiley & Sons. 1886. Quarto, pp. 362. With plates.

SEVENTY-SECOND ANNUAL REPORT OF THE TRUSTEES OF THE MASSACHUSETTS GENERAL HOSPITAL AND McLEAN ASYLUM. 1885. Boston: George H. Ellis, Printer. pp. 97, 8vo.

TRANSACTIONS OF THE AMERICAN SOCIETY OF CIVIL ENGINEERS, April and May, 1886. New York: Published at the House of the Society, 127 E. 23d St.

JOURNAL OF THE ASSOCIATION OF ENGINEERING SOCIETIES of Boston, St. Louis, Chicago, Cleveland, Minneapolis, and St. Paul. June, 1886. New York: 16 & 18 Chambers St.

REPORT OF THE SUPERINTENDENT OF WATER-WORKS OF ROCKFORD, ILL., for the year ending April 25, 1886.

PROPOSALS.

[TOO LATE FOR CLASSIFICATION.]

TREASURY DEPARTMENT, Office Supervising Architect, Washington, D. C., July 23, 1886.—The time of opening bids for the masonry, etc., for the Court-House and Post-Office, Waco, Tex., is hereby extended from two (2) o'clock P. M., July 21, to two o'clock P. M., August 16, 1886. M. E. BELL, Supervising Architect.

JOINER-WORK AT QUINCY, ILL.—Treasury Department, Office of the Supervising Architect, Washington, D. C., July 27, 1886. Sealed proposals will be received at this office until 2 P. M. on the 24th day of August, 1886, for furnishing, finishing, glazing, and fixing in place all the joiner-work, wood flooring, etc., required for the U. S. Post-Office, etc., building at Quincy, Ill., in accordance with specifications and drawings, copies of which and any additional information may be had on application at this office or the office of the superintendent. Bids must be accompanied by a certified check for \$500. M. E. BELL, Supervising Architect.

ANNOUNCEMENT.

The publication of the sixth revised edition of the U. S. Pharmacopoeia (1880), containing as it does much more strict requirements for the purity and strength of pharmaceutical preparations, has been followed in some States of the Union by the enactment of laws against the adulteration of drugs, which laws make the Pharmacopoeia the official standard.

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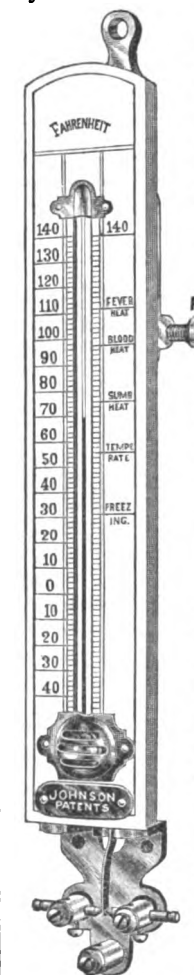
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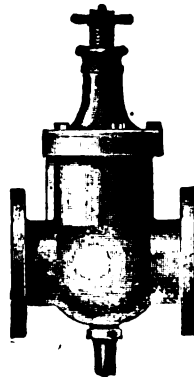
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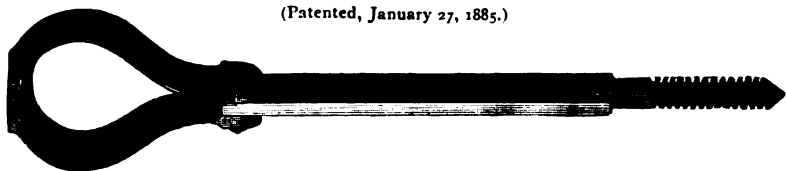
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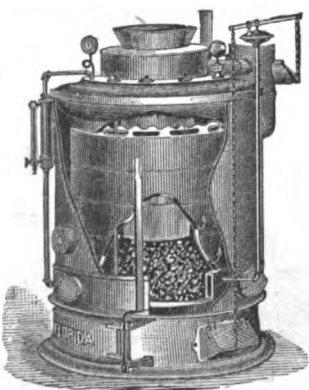
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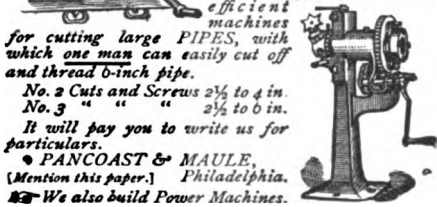
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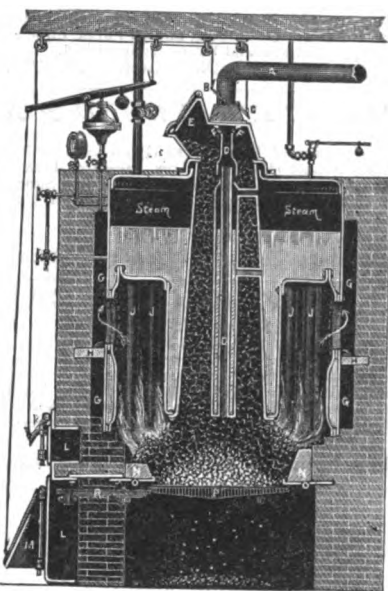
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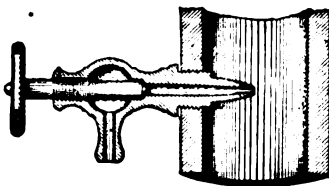
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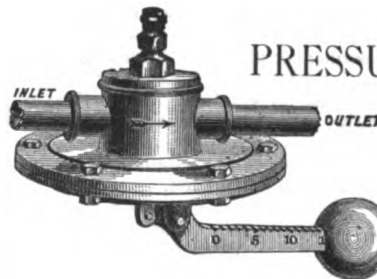
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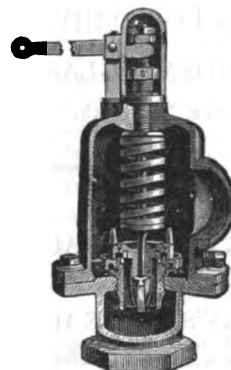
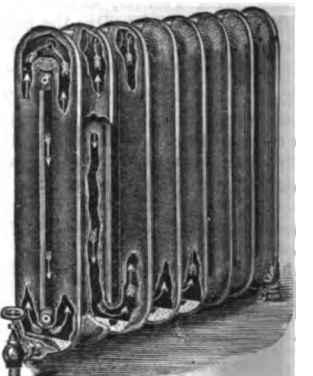
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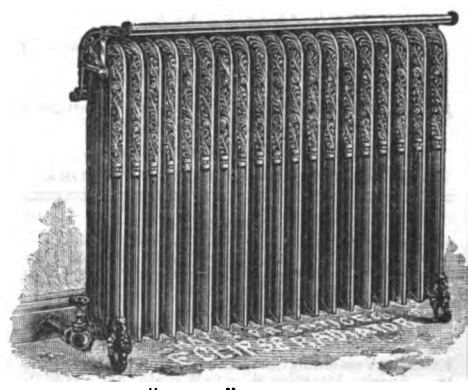
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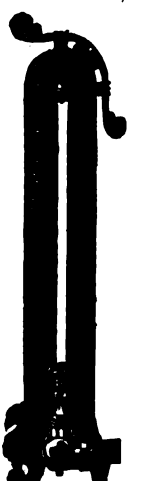
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THE TREATMENT OF SEWAGE.

WHAT shall we do with our sewage? is a question that has been troubling a good many people and communities for the last twenty years, and which bids fair to be troublesome for some time to come. The difficulty in answering it for any given city or locality does not usually depend so much upon ignorance as on the conflict of opposing interests—the interests of the producers of the sewage and of those owning property on the banks of the stream or body of water into which it is to be discharged; the interests of the farmers in the vicinity and of their neighbors; the interests of manufacturers who discharge waste products into the streams; the interests of the taxpayers and the interests of the politicians; and last, but by no means least, the interests of the owners of various patents relating to sewerage and modes of treating sewage, each of whom is a sort of Ishmaelite as regards all the others.

We could give plenty of examples of this conflict of interests in this country, the result being, in the majority of cases, that nothing is done; but better illustrations can be found in England, where the need is more pressing, and where, therefore, increased attention is being given to the subject.

Perhaps no better illustration can be given of some of the conflict of opinion upon this subject which exists among English sanitarians, chemists, and engineers than the paper presented by Dr. C. Meymott Tidy to the Society of Arts, contained in the journal of the society of April 16, 1886, and the subsequent discussion reported in the journal of the society of May 7. Dr. Tidy says he has no patent, that he is an advocate of no system, and that he has not tried to be consistent. He objects to sewage-irrigation and to intermittent downward filtration, on the grounds of cost, of nuisance, and of danger to health, but admits possible exceptions—e. g., a small population, cheap land removed from human habitations, a porous soil, good gradients, proximity to the sea, and proximity to a town. When all these are combined he might approve the trial of sewage-irrigation. His preference is, however, for the chemical treatment of sewage—the so-called precipitation process.

He states five points as being essential to the success of this method—viz.: (1) That the sewage must be treated while fresh—i. e., before active putrefaction sets in; (2) that the sewage should be strained before the chemicals are added; (3) that sufficient chemicals be added to effect complete purification; (4) that after the addition of the chemicals the mixture be well stirred; and (5) that there shall be efficient tank accommodation. Next he proceeds to agree with the Royal Commission in the conclusion, that by combining precipitation with land treatment, or filters, or something of that sort, we obtain the best method of dealing with sewage as an abstract question. Then he proposes what he calls a “common-sense standard for the effluent”—viz.: (1) That it shall be clear and colorless when seen in a white pint cylindrical

bottle; (2) that it shall not be alkaline to test-paper; (3) that if one grain of alum dissolved in 100 grains of water be added to the pint bottle it shall not produce perceptible turbidity after standing thirty minutes; and (4) that if the pint bottle be half-filled with sewage and shaken up it shall not leave foam or much froth after standing ten minutes.

Finally, he doubts the advisability of any water-carriage system for sewage, on the ground that of the thirty gallons per head per day of pure water, only one-ninetieth is used for drinking purposes, and a large quantity is a mere diluent of the sewage, perplexing by its uselessness.

In this last Dr. Tidy seems entirely to overlook the fact that all this water is needed for use, though not for drinking; that it becomes fouled by use, and that when fouled it must be disposed of.

In the discussion of Dr. Tidy's paper various interests were represented by Lieut.-Col. A. S. Jones, Mr. Baldwin Latham, Mr. Peregrine Birch, Professor Dewar, Mr. Dibdin, and Mr. Willis Bund, each of whom objected to some of the Doctor's conclusions.

Dr. Dupre said that after experimenting upon many hundred thousand gallons in all conditions of weather and sewage he had come to the conclusion that no precipitation process which had at present been brought forward did sensibly more than clarify the sewage. He had often thought that a very good thing would be to cultivate the low organisms on a larger scale and to discharge them with the effluent into the river, as the power which these low organisms had was something remarkable. This was, perhaps, the newest and most important suggestion made in the course of the debate. Mr. Bund pointed out that the so-called common-sense standards of Dr. Tidy were useless, owing to the fact that manufacturers had the right to discharge their waste products into the sewers, and that these tests could not properly be applied to sewage containing such wastes.

It would seem that the application of sewage to land, under proper precautions, is the least dangerous and most useful way of disposing of it; that precipitation processes are in some cases useful and even necessary preliminaries to the land filtration; that the disposal of sewage can rarely, if ever, be effected without expense; and, especially, that each case is a problem by itself, to be worked out by a skilled and experienced engineer, and not to be settled by a town council or by a committee of prominent citizens.

ANOTHER PROSECUTION FOR VIOLATING THE PLUMBING LAW.

THE case of Bernard Byrnes, a plumber on Seventh Avenue in this city, whose prosecution by the Board of Health was briefly noticed last week, seems to be a gross attempt to violate the plumbing law by deception. The job was new work in a house on Sixth Avenue. Two-thirds of the cellar-drain was covered in before Mr. Hooper, the Health Board Inspector, began the

examination required by law. On uncovering it some recklessly bad work was revealed. No attempt had been made to close the joints of the drain, either with lead, putty, or even cement; the joints of the rain-leader were similarly defective, and the air-inlet was so loosely connected that the inspector drew it out with his hand. Byrnes admitted that the work was in violation of the law, but asked the inspector to pass it anyway. Of course, he was not gratified, but was brought before Justice Smith and held for trial in \$300 bail. The case is now in the hands of the District Attorney.

When before the justice, Byrnes pleaded that he had remedied the defects in the drain, but a reinspection proved his statement to be untrue, as the joints were found to be still open.

We hope a speedy conviction will once more be a warning that it is dangerous to willfully violate the plumbing law.

THE honorable career of usefulness of the Newport, R. I., Sanitary Protective Association

OUR BRITISH CORRESPONDENCE.

Mines Drainage in South Staffordshire—Defective Registration of Vital Statistics at Calcutta—The American Exhibition—Wooden Blocks for Roadways.

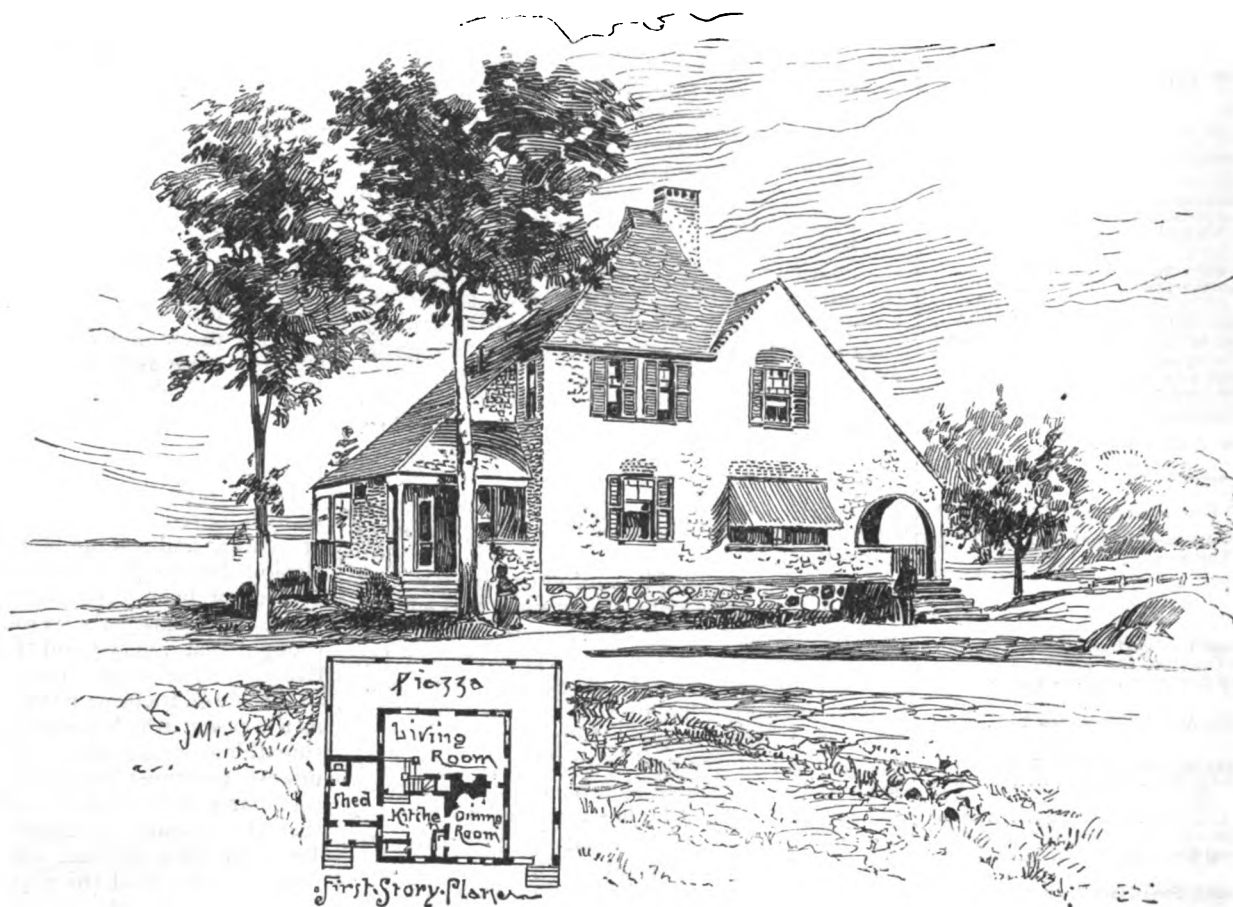
LONDON, July 17, 1886.

THE Mines Drainage Commissioners have carried through an engineering operation in South Staffordshire which will very materially affect mine-owners in that district. This consists in the tapping of water at a point in Bilston. It is hoped that this tapping will have the effect of relieving mines in the district, over an area of some fifteen square miles, from the pressure of water, which has hitherto rendered some seams of coal perfectly unworkable through waterlogging.

Matters in Calcutta must hitherto have been carried through in a very primitive manner so far as the Executive Health Officers were concerned. I am told that when Dr. Simpson, the newly appointed Public Health Officer, who

ings themselves are concerned, I should think application should be made either to the executive of the present exhibition, or to Humphreys, of Knightsbridge, the builder. As I before pointed out, the buildings, as now standing, are proved for the purpose of exhibitions. There will be no labor in the erection, and the cost incurred in acquiring the same will certainly not amount to what it would were new buildings required. The grounds are already laid out, and suitable for evening concerts and promenades, and, above all, the public generally have become accustomed to the location of the exhibition. These factors being present, success would, I am convinced, be in a great measure assured if the present site were adopted.

Some recent experiments in Manchester, dealing with the question of repairing roadways laid with wood blocks, are of considerable interest to vestries and public boards. Hitherto, owing to the unequal wear of the blocks in any one road, resulting from varying density of the wood, it has frequently been necessary to pull up and relay a road with new blocks, discarding all the old ones, of which, possibly, a great number may have had good "life" in them still. To obviate this necessity Mr. A. C. Bicknell,



[A SEASIDE COTTAGE AT CAPE ELIZABETH, ME.—JOHN CALVIN STEVENS, ARCHITECT.]

is once more brought to public attention by the annual meeting last month. Yet we judge, on reading the report of its secretary, Dr. William Rives, that the good works of the association have had a somewhat detrimental effect on its prosperity. As with the fall of slavery the old abolition society suffered, so when the Newport Board of Health was established after a hard struggle by this association, it seems citizens began to think the association not so necessary as it had been, and some lack of interest in it has been experienced the past year. Even should this continue, the city will have owed much to the association; but the secretary's report shows that there is very much yet for it to do, or to assist the Board of Health in doing, and he points out very clearly directions in which the association can be of benefit where the Board of Health cannot yet act.

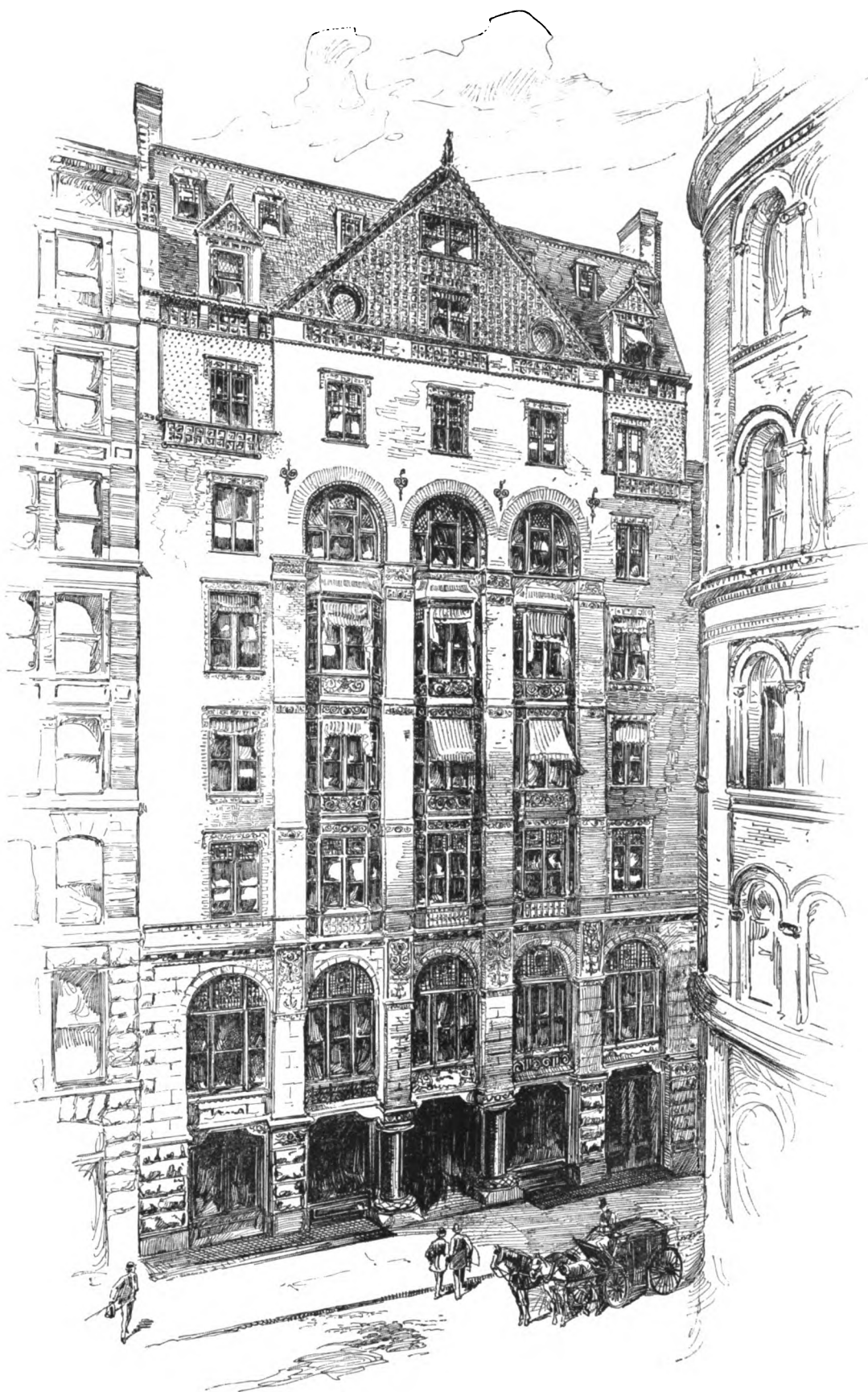
PRESIDENT CLEVELAND has signed the bill imposing a tax on oleomargarine.

went there from Aberdeen, went into the question of registration of vital statistics, he found that not only was the register absolutely useless for ascertaining causes of death, but it was quite unreliable, even in so far as its numbers of registered deaths are concerned.

I have recently seen it definitely announced that the American Exhibition of 1887, which is to be held here, will take place in certain buildings in Earl's Court (Kensington) which have yet to be erected. I suggested on a previous occasion the advisability of taking over the exhibition buildings at South Kensington, which have been used for the past four years for the International Exhibitions. I would again refer to the suggestion as meriting attention by the promoters and those specially interested in making the exhibition a success. The existing buildings stand on the ground belonging to a certain horticultural society, whose funds were at so low an ebb at the time they rented it to the Exhibition Commissioners that it is notorious that their life as a society has been saved by the operation. It is not likely, therefore, that they would object to lease the ground again for the same purpose. So far as the build-

of the Sandycroft Foundry Company, Chester, has invented a machine of traction-engine type, self-propelling, having in front a revolving table fitted with cutters. A section of a road was laid with old blocks, which had been discarded as unfit for further service. The method of laying was the usual one, in cement and sand, and being composed of old blocks pitted with sand and gravel the experimental road presented the normal features of an old road requiring repair. When several days had elapsed, to allow the cement to set, the machine was brought to work, the cutting-head being gauged to cut $\frac{1}{2}$ -inch below the surface of the lowest face of the roadway. In the course of the work it was necessary to take off three inches from some of the blocks, and the result throughout was satisfactory. The system of planing down a roadway is certainly novel.

SAFETY-VALVE.



THE SANITARY ENGINEER ILLUSTRATED SERIES.

THE ASTOR BUILDING, WALL STREET, NEW YORK.

H. J. HARDENBERGH, ARCHITECT.

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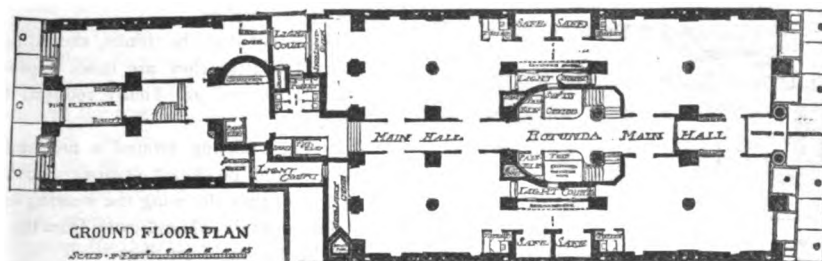
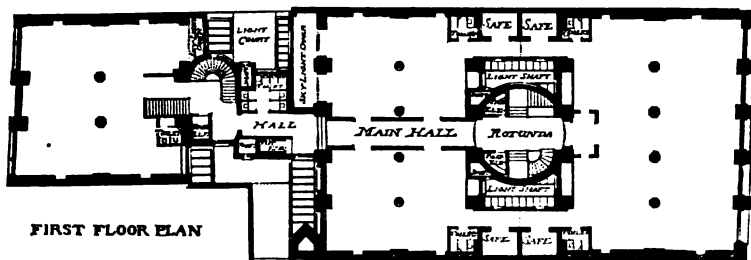
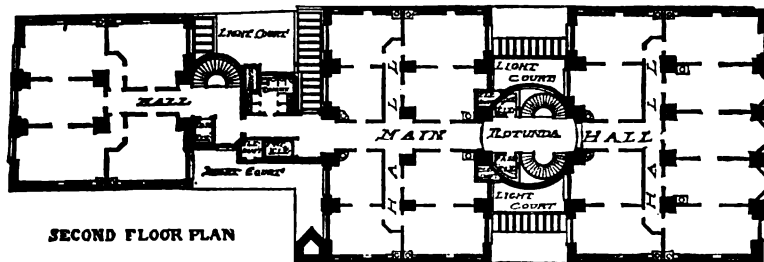
ANN ARBOR, MICHIGAN, U.S.A.

1964

OUR SPECIAL ILLUSTRATION.

"THE ASTOR," WALL STREET, NEW YORK.—H. J. HARDENBERGH, ARCHITECT.

THE "Astor" building, No. 10 Wall Street, New York, is the property of John Jacob Astor, Esq. The basement and first story of the façade are of red sandstone. The columns on each side of the entrance are of polished granite, with polished gray marble capitals. The upper stories of the building are of red brick, with red terra-cotta trimmings. The projecting bays are of copper. The entrance is provided with elaborate wrought-iron gates. The vestibule and staircase halls are noticeable for the very successful use of buff terra-cotta as a wall and ceiling covering. There is a polished black marble wainscot about six feet high with a dark-red marble capping; above that the walls are covered with large bricks of buff terra-cotta simply ornamented in low



relief. The cornices, with their richly molded decoration, are of the same material. The ceiling of the vestibule is formed by filling in between the iron beams with similarly ornamented slabs of buff terra-cotta flush with the lower flanges of the beams, which are bronzed. Bronzed strips run transversely across the beams riveted to their under sides, dividing the ceiling into panels and assisting in holding the terra-cotta in place. A bronzed metal strip also forms the upper member of the cornice. The general arrangement of the building will be clear from the plans we give.

The contracts for the building, which runs through from Wall Street to Pine Street, aggregated about \$445,000. The narrower Pine Street façade is similar to the Wall Street front, but simpler in its treatment.

The architect is H. J. Hardenbergh, of New York.

OUR ILLUSTRATION OF A MODERATE-COST HOUSE.

A SEASIDE COTTAGE AT CAPE ELIZABETH, ME.—JOHN CALVIN STEVENS, ARCHITECT.

THIS cottage is the summer residence of Hon. C. F. Libby, and was built about two years ago at an expense of about \$2,300, the contractor being Mr. John Rackley. The architect is Mr. John Calvin Stevens, of Portland, Me.

THE Chicago Department of Public Works complains bitterly of the extravagant use of water in dry hot weather, the amount drawn being from 103 to 109 million gallons daily. A great deal of the waste is due to careless use of lawn-sprinklers, and much is caused by consumers letting the water run all the time from a faucet to "keep it cool." A cool or rainy day makes a difference of ten per cent. in the consumption,

IRRIGATION.

(From our Special Correspondent.)

ONE of the most interesting excursions made by the American Society of Engineers during their stay at Denver was to the little town of Greeley, about fifty miles from Denver on the Denver Pacific Railroad. Mr. Choate, of the Union Pacific, took occasion on the trip out to give the party an experience in rapid running, the speed reached by the train being at one time seventy miles per hour. Greeley contains now about 2,500 inhabitants, a number of handsome residences and public buildings, has beautiful shade trees and lawns, all built up within fifteen years in a place formerly covered with cactus and sage-bush and the abode of prairie-dogs and jack-rabbits. The change has been made possible only by irrigation. The water for the supply of Greeley and vicinity is taken from the Big Thompson River by a canal twenty-six feet wide and five feet deep,

ing to rest the eye for miles in the distance. On the other side a ditch perhaps three feet wide carried a bright running stream, and beyond were waving fields of grain, corn, or alfalfa, with an occasional tree or a line of trees, the green being all the brighter when compared with the sterility so closely adjacent.

Some very interesting details respecting irrigation were obtained from Mr. George G. Anderson, Chief Engineer of the Northern Colorado Irrigation Company, better known as the English Company. In addition to the two canals mentioned this company has built the Platte Valley (or Evan's Ditch) Canal, 26'x3', now twenty-eight miles long and to be built ten to fifteen miles further, and the Platte Canal (or High Line), forty feet wide and seven feet deep for forty-six miles of its length. The length of the latter, including one branch, is eighty-three miles. It is calculated to irrigate 50,000 acres, of which 20,000 are now under cultivation. The grade of the main canal is about twenty-one inches per mile. For the remainder (beyond the forty-six miles) the width diminishes to thirty-five feet, and then to twenty feet, and the depth to 4½ feet, with a grade of thirty-two inches. The branch reduces to final dimensions of 15'x4½', with a grade of 3½ feet per mile.

The water is diverted from the South Platte in the cañon at about eighteen miles south-westerly from Denver by a dam 120 feet long and 14 feet high, with a capacious waste-way twenty-four feet wide and the full depth of the dam at its western end. The water is turned by the dam into a tunnel through the mountain 600 feet long, 25 feet wide, and 12 feet high, with a grade of 1 foot per 100. At the entrance of the tunnel are five head-gates, operated by screws. For a distance of 2,700 feet from the tunnel is a timber flume resting on a bench thirty-six feet wide cut in the rock, the flume being twenty-eight feet wide and seven feet deep, with grade of 1 foot per 100. The crossings of Cherry and Plum Creeks are 36 feet wide, 7 feet deep, and respectively 918 feet and 810 feet long, probably the longest in the State. Figure 1 gives a view of the latter. There is a total length of 3,123 feet of flumes, and the total cost of the work was \$640,000.

The appropriation of water for the canal is 1,184 cubic feet per second. The State law requires that the water be measured for all canals by the actual quantity taken from the streams. On the contrary, the companies were required to sell the water by the uncertain measurement of the inch. This measure is defined to be the quantity flowing continuously through a hole one inch square in an inch board with five inches depth of water over the top of the hole to be supplied for every acre of ground irrigated. By experiment fifty-five statute inches give 1.44 cubic feet per second, and it is claimed that this is enough for eighty acres of ground instead of fifty-five. This question of the "duty" of water is one of the unsettled ones, every man having his own ideas according to the skill he displays in the use of water or the character of the soil irrigated. One thing is to be noted, that in time the lower grounds on a farm seem to become more moist through seepage and to require less irrigation, in some cases none, and in some cases even becoming marshy.

One of the great difficulties is the seepage and evaporation. For example: Mr. Anderson stated that allowing twenty-five per cent. for these losses, if 480 cubic feet per second were allowed to enter at the head of the canal 360 feet would be available for distribution. This at 1.44 feet per

and carried thirty-one miles. It is of sufficient capacity to irrigate 22,300 acres, and 10,000 acres are now under cultivation. An excursion was made in carriages about six miles to see the effects of irrigation. This brought us to the vicinity of Governor Eaton's farm, which is irrigated by water from the Larimer and Weld Canal, which takes its supply near Fort Collins from the Cache la Poudre River by a canal thirty feet wide, five feet deep, and forty-five miles long, calculated to irrigate 36,000 acres, of which 25,000 are now under cultivation.

It is scarcely possible to conceive of more violent contrasts than those on this short ride. On one side of the road might be seen a dry, sterile, forbidding country, with noth-

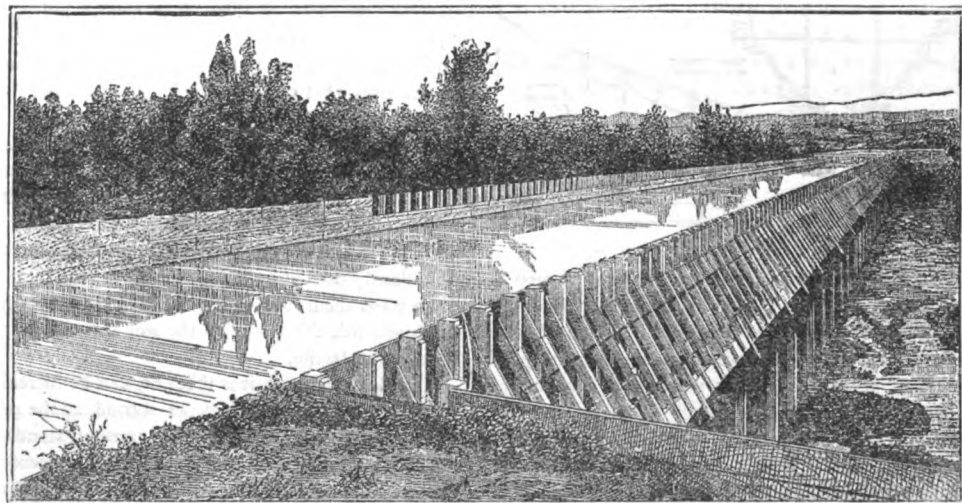


FIGURE 1.—AQUEDUCT OF PLATTE CANAL CROSSING PLUM CREEK AT ACEQUIA.

second continuously for eighty acres would be sufficient for 20,000 acres. In a length of forty-five miles 8,000 acres are irrigated, and at the end, instead of having enough for 12,000 acres, only enough for 6,000 remain in the canal, the total loss being nearly fifty per cent. of the amount entering the canal.

The canals are carefully watched by inspectors to prevent tampering with the distribution-boxes.

The measurement now is by quantity, and the English Company use the basis above mentioned.

The irrigation laws now allow of the use of the cubic foot, but the question of "duty" remains unsettled; neither is the method of determining the quantity fully established. Weirs take away from the head available, and unless properly located would be unsatisfactory. "One great need now is an accurate, automatic, and easily comprehended device by which distribution may be made to customers."

The English Company bought 40,000 acres in the regions reached by the Platte Canal from the railroad company at \$2.50 per acre. This they sell, with the right to



FIG. 2.

the water, at \$25 to \$50 per acre, and to other parties the water-right at prices fixed upon according to location. On all land thus irrigated a charge is made of \$1.50 per acre per year, but this charge is being contested in the courts.

In the Cache la Poudre district "water-rights" were sold at \$400 at first, and now at \$1,200. This right was for water for all times to irrigate eighty acres. A charge of \$10 per year per right was made for repairs, but this is not sufficient. When all the rights are sold that the canal will supply, the ditch is to be turned over to the land-owners, and the company's connection with it will cease from that time.

Of course, the water is delivered to the consumer at the highest practical point on his farm. After this the skill of the farmer has much to do with the "duty" obtained. Ditches are run along the ridge or highest side of the farm, and branches turned off as may be desirable in various directions. The water may be diverted to these by a simple side dam of earth, or a sort of flume provided with a board set at an angle such as to turn aside the desired amount.

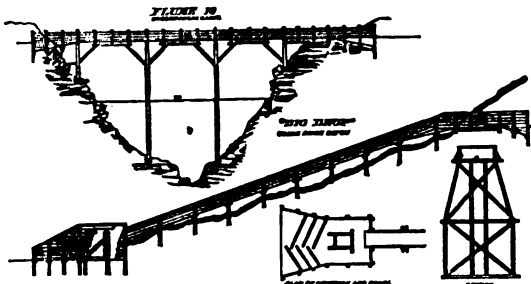


FIG. 3.

Water is never turned upon the land before the seed is sprouted, and the first irrigating is done after the crops are above ground. Grain is always well irrigated when it is in the milk, and these two wettings are frequently all that is needed. There are never more than four irrigations per year on any crops.

To irrigate a field, if the crop be in drills the water is allowed to run between them; if not in drills, trenches twelve to eighteen inches wide are made with the plow or shovel, at distances of 50 to 100 feet apart. If the slope be not too great, these run directly across the field, but if

the slope be steep, they will be made diagonally, as shown in Fig. 2, or even winding about if necessary.

In turning the water from the ditch, small openings are made with a shovel at short distances, and the ditch dammed if necessary until a sufficient quantity of water has been turned upon the land. The process is watched, and if any part of the field is not receiving its supply a small trench is made directly to it. The openings thus made are then closed up and the water turned to other parts of the field. The two irrigations thus usually given for wheat (never more than three) are equal to a rainfall of three to five inches.

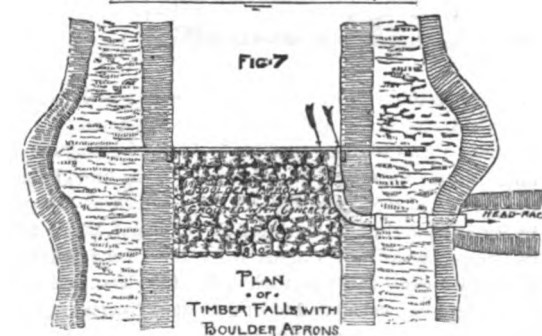
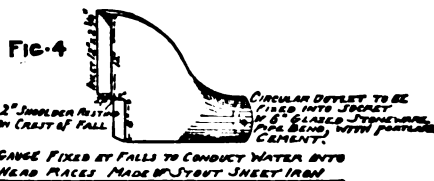
The total cost of irrigation is \$2 to \$2.50 per acre, and one man can irrigate eighty acres.

The rainfall in Colorado is about fifteen inches annually, so that irrigation is everywhere a necessity.

In a paper read before the Denver Society of Engineers by Mr. Walter N. Graves, he states that nearly one-half of the entire area of the United States, or 900,000,000 acres, is arid. Of this area about 280,000,000 acres are considered arable—that is, capable of being redeemed and utilized. Of this arable portion nearly 32,000,000 acres have been brought under cultivation by means of irrigation.

From Mr. Graves's paper, and the chapter on irrigation in the pamphlet furnished the engineers by the Denver society, we condense the following additional notes on irrigation:

Mr. Graves points out the ultimate necessity of more comprehensive and elaborate schemes than any yet executed, by means of which extensive reservoirs in the mountain gorges shall retain the floods of the spring season, and make them available for the mitigation of the summer



drouths. He refers to the 53,000 reservoirs, with 30,000 miles of embankment, and especially to the "Veeyanum Tank," with an embankment twelve miles in length, and covering an area of thirty-four square miles, all in the "Madras Presidency," and to the 200,000,000 of people in India dependent on irrigation for the means of subsistence, as showing what can be done by it for the development of our country.

Among the advantages claimed for irrigation are immunity from drouth or from excessive moisture and flood. The ability to control the growth of a plant as to season, and to cultivate a wider range of plants; also to supply certain elements to the soil as phosphates, sulphates, etc., abundantly carried by the water of the mountain streams, or to wash them out where in excess. The silt carried, gradually fills the pores of the soil and makes it more retentive and fertile.

The duty of water, it is thought, can be increased to 100 to 120 acres per cubic foot per second, as the present use of the water is excessive. The present standard of the older irrigating ditches is one cubic foot per second, during the irrigating season of 100 days, for about fifty acres. In some cases this has been raised to about sixty acres, and is equivalent to an annual rainfall of about twelve feet.

In reference to construction of the canals, the slopes are determined by the amount of water to be carried, the nature of the soil as to friability, as to whether the water is silt-bearing or not, etc. The lowest slope is on the Citizens' Canal in Southern Colorado, where six inches per mile is the slope for some distance. In the rock-cuts of the Del Norte Canal it is thirty feet per mile. The range generally is below three feet per mile. "The velocity of current generally sought for is from three to five feet per second."

As to cross-section, it is not usually necessary to build banks on both sides. The bottom width is usually two and a half to three times the depth, and often a subgrade of one to two feet is made at the centre with a wide berm between it and the toe of the embankment. The inner slopes of banks in loose soils are made two or three to one; in firm soils one and a half or two to one; and in rock from one-fourth to one, up to one to one. Head-gates are very simply made of wood, with iron screws for raising and lowering; but they are not so substantial as they ought to be, considering their importance, and they are frequently destroyed by floods.

In some localities, for topographical or economic reasons, sudden drops in the grade-line are desirable. When not too great, a simple tub, set below the lower grade-line, receives the water as it falls. At the Big River in the Grand River ditch (see Fig. 3) the water above is thirty feet wide and four feet deep, and is drawn down a sluice 5'x4', descending thirty-five feet in 125 feet. It is then discharged against a boom of solid timbers and thrown back in a penstock, whence it escapes over a rippled floor.

Evaporation is said to range from 0.088 to 0.16 of an inch per day.

Captain Edward L. Berthoud, of Golden, says that he has as yet found no soil where a less grade than one inch per 100 feet was needed, and except in loose sandy soil he would never use less than 1 1/4 inches.

In streams heavily surcharged with detritus from gold washings 2 1/2 inches per 100 feet is just about sufficient to remove the sediment and prevent its accumulation in the bends of the ditches.

Slopes in cuttings, he thinks, should not be less than one to one. If flatter they are more exposed to wash from sudden rains, and are finally reduced to one to one or steeper.

In an open cutting around a mountain slope the ditch bottom should be sloped downward toward the hill 1/4 to 1/8 of a foot, thus throwing the wearing force of the current near the mountain side and away from the bank, and diminishing the danger of cutting.

He considers the mortise and tenon joints for flume frames bad on account of retention of moisture and consequent decay; also from the difficulty in making repairs. He has introduced the use of bolts, and finds them cheaper and equally good.

Mr. Graves quotes formulæ applicable to the flow in these canals as follows:

Fanning's, with coefficients determined by experiment,

$$V = \left(\frac{2g}{m} r s \right)^{1/2}$$

in which

V = mean velocity in feet per second,

$2g$ = twice the acceleration due to gravity = 64 ft.

m = a variable coefficient for friction ranging from

.035 to .060 for ordinary canals,

r = hydraulic mean depth,

s = inclination or sine of slope.

The Kutter formula:

$$V = c \sqrt{r s}$$

in which

V = mean velocity,

c = a variable coefficient,

$$= \frac{41.6 + \frac{1.811}{n} + \frac{.00281}{s}}{1 + \left\{ \left(41.6 + \frac{.00281}{s} \right) \sqrt{\frac{n}{r s}} \right\}}$$

r = hydraulic mean slope,

s = sine of slope,

n = a coefficient ranging from .038 to .070.

Among other large canals not hitherto mentioned are the North Poudre Canal, about thirty miles long, capable, with

the assistance of a number of natural reservoirs, of irrigating 75,000 acres.

The Uncompaghe Canal, fifty-one miles in all, twenty-four feet wide at the head gate, with a slope of one in 1,560. It has frequent drops and falls, and at fourteen miles from the head drops 230 feet over the edge of the mesa, into a dry wash. It follows this six miles and is taken to the top of a second mesa. It has about $6\frac{1}{2}$ miles of rock excavation, eighteen flumes or aqueducts, and cost \$210,000. Figure 3 shows one of the flumes.

The Fort Morgan Canal is twenty-eight miles long, and has one flume 2,700 feet long, and thirty feet high, costing \$22,000.

The Rio Grande Canal is thirty-two miles long, and at the head sixty feet width, with $5\frac{1}{2}$ feet depth of water, discharging 1,400 cubic feet per second. It cost \$120,000.

The Citizens' Canal is forty feet on bottom, $5\frac{1}{2}$ feet depth of water, side slopes three to one, capacity 1,000 cubic feet per second, and cost \$125,000.

The Del Norte is the largest in the United States, being ninety-eight feet wide at water-line, forty-two feet wide at bottom, with $5\frac{1}{2}$ feet depth of water, about fifty miles of channel, including branches, carrying 2,400 cubic feet per second, calculated to irrigate 200,000 acres, and costing \$300,000.

The entire system in Colorado embraces about 800 miles of completed canals, about 150 miles projected, and 3,500 miles of secondary canals. The large canals have cost about \$5,000,000, the smaller have cost \$3,000,000, and the entire system from ten to twelve millions. The total area of land supplied is about 2,200,000 acres, and the estimated arable land is put down at 26,000,000 acres. (This is stated as much less by other parties.)

With irrigation all the fruits and other products of the temperate zone can be raised in perfection, and they compare favorably in both quantity and quality with the products of other parts of the country.

A stranger cannot but be struck with amazement at the reckless manner in which the woods on the mountain slopes have been and are being destroyed. If properly conserved, they not only would be sources of greatly increased revenue in the future, but what is of infinitely greater importance, they themselves are the great conservers of the water-supply of the country, serving by their shade, their roots, and the moss, and other accumulations about them, to retain the winter's snows and summer showers, and cause the flow of the streams to continue full and strong during the heat of summer. The present indications are that, when too late, the people who are dependent on irrigation for their crops, and indeed for life itself, will find that nature surely visits those who violates her laws, and that the thoughtless devastation of a few short years will require centuries of labor and care to replace.

In a recent discussion upon water-works in South Africa, Mr. J. Wolfe Barry, Member of the Institution of Civil Engineers, calls attention to the serious effects now arising there from the denudation of the country by the felling of timber. The water supply of many towns was being endangered, while floods were being increased. He calls for Government control of the *wasteful* disforestation that is now taking place.

In connection with the subject of irrigation as practiced in the West, we would call attention to an example of the practice in New Zealand. In the Proceedings of the Institution of Civil Engineers for 1883 is a paper by Mr. G. F. Ritso, on "Water-Supply and Irrigation of the Canterbury Plains, New Zealand." These comprise an area of about 2,500 square miles, having a length of about ninety miles, and extending inland from twenty-five to forty miles. At the foot of the mountains the elevation is about 1,500 feet. The plain is traversed by six rivers, running over shingle beds, consisting of rounded boulders. These are subject to heavy floods, and in times of drought disappear. The soil is six to eight inches deep resting on shingle, and, before cultivation, produces only bunches of grass, and is almost treeless. The boulders are largest and slope steepest near the mountains. Water is obtained from wells near the sea at moderate depths, but for a strip of twenty miles it cannot be obtained at less than 200 feet depth.

A concrete dam, 300 feet long, three feet thick on crest, and going down two feet into the bed-rock with suitable foot protection, was built across the River Howai. A sluice-chamber led the water through a tunnel 3,000 feet long into an open channel fourteen feet wide and two feet

deep. The gradient of the country being eighty feet per mile, 6-inch concrete falls were put in as often as required, and by successive additions this channel was carried for twelve miles below the head-works. Each such fall cost \$25. Below this the channel was branched into two of eight feet each, with 6-inch *timber* falls, and these were continued for fifteen miles further. The excavation cost about \$100 per mile, and the timber falls about \$4.50 each. Including bridges and all works, the cost was about \$500 per mile.

At the ends of the main branches the average grade was twenty feet per mile, and about thirty-three miles more of small channels three feet wide and eight inches deep were made at a cost of \$40 per mile.

A water-race district was then declared, comprising 118,000 acres; after deducting 10,000 acres for roads, reserves, etc., this was divided into seventy-two blocks of 1,500 acres each, and one supply or "head-race" given to each block. For full irrigation about ten times the flow of the Howai would be required; but the quantity furnished was sufficient to teach the proprietors the *value* of irrigation, and prepare the way for a more extended and expensive system.

To divide the supply into these seventy-two heads required a system of gauging, so that each might have its due share. For this purpose the apparatus shown in Figs. 4 to 7 was adopted.

Figure 5 is a section along the centre of the stream through one of the timber falls. Figure 6 is a transverse section of the canal below the fall, and Fig. 8 a *plan* of the fall. The width of the fall is eight feet, or 192 inches. Allowing thirty inches, or a part one-sixth of this width for evaporation and percolation, 162 inches are left, and this divided into seventy-two parts gives $2\frac{1}{4}$ inches as the portion to be deflected into the head-race at each block. To accomplish this the sheet-iron box shown in Fig. 4 was adopted. The height of the opening is twelve inches and width $2\frac{1}{4}$ inches, so that any depth of water up to twelve inches can enter, and the sides are then gradually drawn in to the form of a cylinder of six inches diameter, to which lengths of pipe are attached leading to the head-race. The box is so shaped as to set closely on the 2-inch plank of the timber fall, its position being clearly shown in Figs. 5 to 7.

The percolation is found after some use to be very small, but the evaporation is large, and the method can only be called an approximate one. About 200 gallons per acre per day is the present supply. About 500,000 acres per day are now partially irrigated by this and other schemes at a total cost thus far of \$250,000.

LEAD SERVICE-PIPES FOR MISSISSIPPI RIVER WATER.

At the recent meeting of the American Water-Works Association, at Denver, Mr. L. H. Gardner, of New Orleans, presented several specimens of lead service-pipe which had been in use from a few months to ten years, and were interiorly coated with a deposit which an analysis by Professor R. M. Girling showed to consist chiefly of silicate of alumina, iron oxide, and silica. Between this deposit and the lead itself there had formed a thin layer of insoluble lead oxide. When this was removed and the interior surface of the pipe examined under the microscope the longitudinal *stria* formed by the mandrel used in the manufacture of the pipe were found to be perfectly distinct, proving that in years of constant use none of the metal had been dissolved. The professor concludes that deleterious effects can follow the use of Mississippi River water drawn through lead pipes. In this opinion Dr. W. H. Watkins, of New Orleans, concurs. Mr. Gardner also presented the following analysis of the river-water made by Professor Girling:

NEW ORLEANS, LA., June 14, 1886.

Analysis of Mississippi water drawn from iron service-pipes as supplied by water-works company.

General appearance, turbid, owing to solids in suspension consisting chiefly of silicate of alumina, iron oxide, and silica.

Odor heated to 40° C., none.

Appearance of filtered water, colorless.

	Parts in 100,000
Total solids on evaporation.....	12.500
Sodium and magnesium chlorides.....	0.739
Calcium carbonate.....	4.026
" sulphate.....	0.975
Magnesium carbonate.....	2.385
Potassium sulphate.....	0.912
Aluminium and iron oxides.....	0.156
Silica.....	1.260
Organic matter volatilized by heat and loss.....	2.047
	12.500

Chlorine in Chlorides.....	0.4800
Nitrites.....	none.
Phosphates.....	minute traces.
Nitrogen as ammonia.....	0.0085
Albuminoid ammonia.....	0.0030
Nitrogen in nitrates.....	0.0190

Hardness, temporary..... 4.030

Hardness, permanent..... 3.380

R. M. GIRLING, Chemist.

HEATING AND VENTILATING IN THE ROYAL HOLLOWAY COLLEGE.

THE heating and ventilating arrangements of the Royal Holloway College, Egham (England), have been carried out under Mr. R. B. Stirratt, engineer, Westminster, and the following concerning them will be of interest: For the heating, the leading conditions were that the medium be steam; the boiler-house to be 200 yards distant from the main building. The latter is 525'x360' square. That four corridor floors, besides entrances, should be heated, and capable of being controlled from the basement or locally. Those points have been met as follows: The steam plant includes three Lancashire boilers—there are two other boilers, one used for power purposes—30'x7' 6", flues 3 feet diameter, 6-foot grates, $\frac{1}{2}$ -inch shells, $\frac{1}{8}$ -inch ends of Snedshill and mild steel, $\frac{3}{8}$ -inch flues with Adamson's flanges, set with the draught going under the bottom and returning along the sides. From these a 6-inch main steam-pipe leads direct to the centre of the main building, where a receiver is fixed. From this all branches are taken through reducing-valves. The plan of the building permits its division into four main parts. The distribution of the steam in the corridors and to the radiators on each floor is as follows: To insure the delivery of steam at all points, three pipes are employed, one 4-inch supply and one 3-inch return, both running in the same direction, and from the extremities a condensed-water-pipe is led back to a container in the basement, from which the water of condensation returns by gravity to the boilers to be re-used.

The radiators are made of 1-inch wrought-iron pipes fixed vertically in a hollow cast-iron base with an entablature of ornamental design, and require no casing. The surface of each is about 25 square feet and the number 160; the positions having been selected with a view to the best diffusion of the heat.

Each radiator has a separate flow and return $\frac{3}{4}$ -inch wrought-iron pipe, and is provided with valves in the basement and others attached to itself. The chapel is warmed by a box-coil of four $1\frac{1}{4}$ -inch wrought-iron pipes placed behind the seating, with openings in the risers of the seats for the circulation of air. The picture-gallery has six radiators in it, three on each side. The surface is about 150 feet. The dining-hall has six of the cast-iron radiators, for which a medal was given at the Health Exhibition.

The library and museum have each eight circular radiators placed between the tables, and carrying upon the tops standards for lighting purposes. The music-rooms—twelve—are created with a simple loop of $\frac{3}{4}$ -inch wrought-iron pipe 24 inches high. The lecture-theatre has four radiators of same design as in the corridors. All available water of condensation is collected and returns to a tank in the boiler-house, from which it is pumped back to the boilers. The alignment of the pipes has been selected so as to cause the steam and water of condensation to flow in the same direction.

The steam-power plant consists, as we have said, of Lancashire boilers, 30'x7' flues, 2' 9" diameter; grates, 6' long; usual fittings; to work up to 75 pounds pressure. They have a separate chimney, and supply steam to the two electric-light engines, now fixed. These are coupled 16 $\frac{1}{2}$ -inch cylinders, 32-inch stroke, driving a long shaft, from which the dynamos are run. The engines are fitted with Paxman's automatic expansion-gear. These boilers will also serve the laundry and a hauling-engine, which will be employed to operate trucks upon a tramway laid in a subway from the stores to the main building about 300 yards.—*The Engineer*.

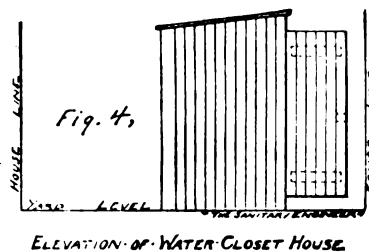
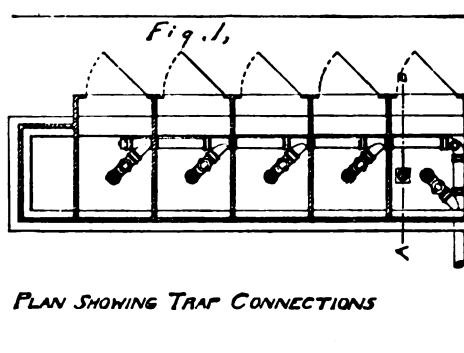
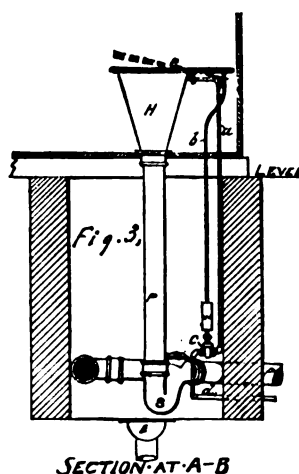
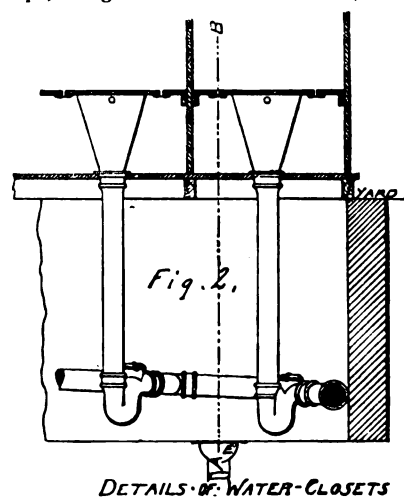
DETAILS OF PLUMBING IN A DIVISION STREET, NEW YORK, TENEMENT.

HEREWITH we give details of plumbing in the five-story double tenement-house Nos. 35 and 35 $\frac{1}{2}$ Division Street, New York.

The house-drain from the sewer in the street to the inside of the front area wall is six inches in diameter, and the

specification required that "joints be made with cement-mortar, one part good hydraulic cement and two parts clean, sharp sand," and "that each length of the pipe be of George W. Rader & Company's make, thoroughly glazed, cylindrical in shape, straight and free from checks, and

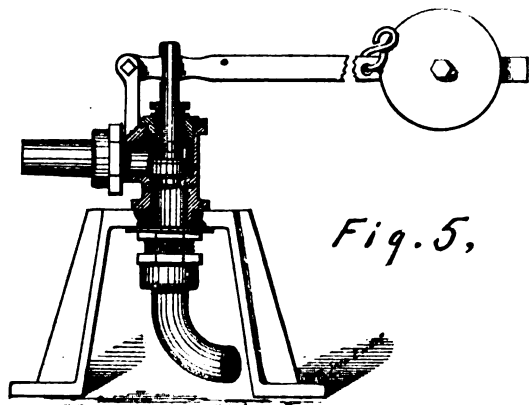
of four feet, with doors opening outward, and with a locker at one end, through which access to the pit is obtained. The walls are of hard brick eight inches thick, with paved bottom, one part Rosendale cement and two parts of good sand being used for mortar.



that will give a clear, ringing sound when struck with an iron instrument."

From the area wall then the remainder of the soil and waste-pipes are extra heavy cast-iron. The part of the house-drain from the area wall to the rear wall of cellar is six inches in diameter, with the usual trap and foot-vent at front wall, and a 5 and 4 inch Y-branch and 4-inch trap at rear wall to receive rain-water leader. The 5-inch branch of the Y is carried to the yard and reduced to four inches to receive the soil-pipe from the water-closets in the yard, shown in the illustrations, Figs. 1, 2, 3, and 4. Three-inch Y-branches are provided in the cellar for the reception of the waste-lines from the sinks and wash-tubs. From the Y's in the house-drain the 3-inch cast-iron waste-pipes are carried three feet above the roof of the building and finished with a cap, with the necessary Y-branches at the different floors.

The water-closet service for eighteen families consists of five rim-flushing enameled hoppers, or a



hopper for each of the upper floors of four families each, and one for the lower floor of two families and stores.

The problem here is to provide water-closets in a yard-service that will not freeze in cold weather. To this end is provided a pit or manhole four feet deep by two feet six inches wide, by fourteen feet six inches long (see Figs. 1, 2, and 3). Five stalls of two feet six inches between the partitions are provided, with an inside depth

Each set of rooms has a galvanized-iron sink, 24"x18", set on galvanized-iron brackets, and wooden wash-trays, all with $\frac{3}{8}$ -inch self-closing cocks and $1\frac{1}{2}$ -inch heavy leaden waste-pipes and traps. Two-inch ventilating-pipes of iron are used, with $1\frac{1}{4}$ -inch back-air from traps, the vent-pipe joining the waste-pipe below roof.

For the water-supply of the building a 2-inch lead pipe, seven pounds to the foot, is run from the tap in the main to a 2-inch round-way cock inside basement wall. From this point galvanized wrought-iron pipes were used, being two inches diameter in cellar, $1\frac{1}{4}$ to second floor, one inch to fourth floor, and $\frac{3}{4}$ to fifth, there being two such rising lines. A "Crown" water-meter is used to measure the water used.

Iron hand-pumps with frames are used at the sinks on the third, fourth and fifth floors at each sink to elevate the water, the pressure being poor in that section of the city.

Figures 6 to 13 are reproductions of the drawings by which the plumbers worked. The cost of the work was \$1,200, the wooden wash-trays being furnished by the owners.

The work was designed by Frederick N. Owen, E. M., of 96 Fulton Street, New York, and the master plumbers were Messrs. Moody & Bracken, of 951 Sixth Avenue, New York.

ENGLISH PLUMBERS AND THE PROPOSED PLUMBING REFORM.

THE action of English master plumbers, under the lead of the Plumbers' Company, of London, in establishing a system of registration for plumbers, meets with continued favorable recognition from all classes of journals. The latest instance coming to our notice is that in the *British Medical Journal* given below:

"The movement," it says, "to promote the improvement of plumbers' work appears to be making considerable progress, and that, too, of a particularly sound kind. The ancient Guild of Plumbers sets an example worthy of the imitation of other city companies. It may boast, like

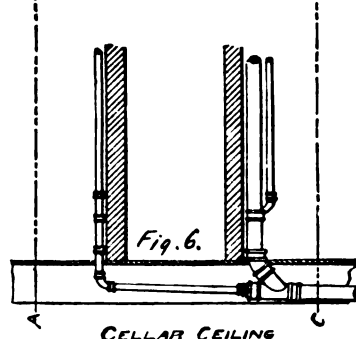
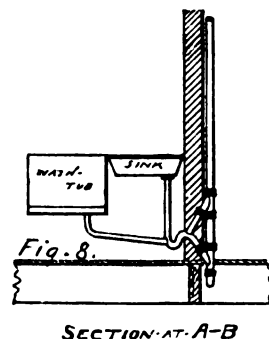
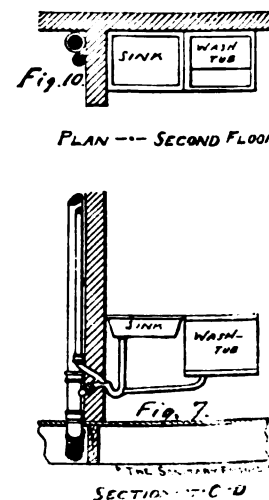
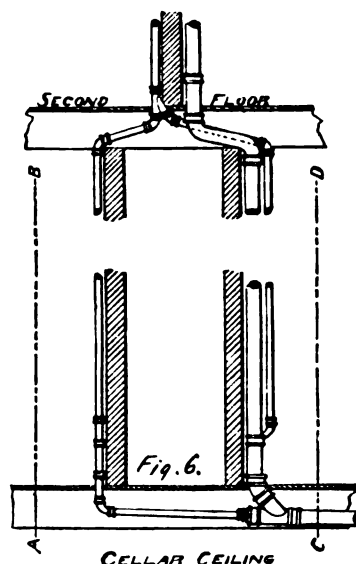
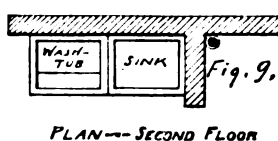
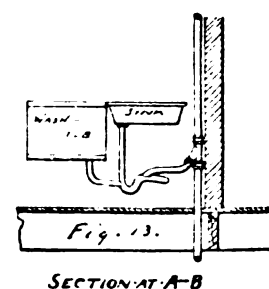
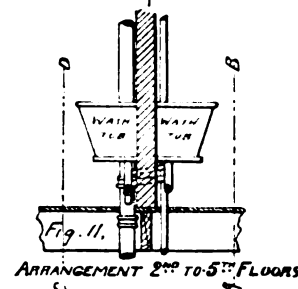
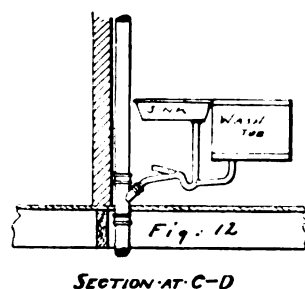


Figure 1 shows a plan of soil-pipe and trap connections, Fig. 2 a front view, and Fig. 3 a cross-section.

The water-supply to the closets (d) is 1-inch galvanized-iron pipe taken from the supply in the cellar, and to prevent its freezing it is covered with boiler-felting and passed through a 4-inch cast-iron pipe from the cellar to the pit. Each closet is supplied through a $\frac{1}{2}$ -inch branch (b) from this pipe with a $\frac{1}{2}$ -inch special quick opening and shut valve and waste (c), shown in detail in Fig. 5. They are near bottom of pit and are operated by the seat, a weight at opposite end from spindle closing the valve and lifting the edge of the seat after use.

them, that its roots extend back to distant centuries. But it can do more than this; it can point to a unique series of successful modern graftings upon the old trunk. The company has been for some years past under a vigorous administration, which cultivates modern ideas, recognizes new scientific truths, and regards recent experience. Thus it has acquired a recognized position among the members of the craft, and may claim prescriptive rights to regard beyond any which could attach merely to its ancient ordinances and obsolete powers. A recent meeting of the Plumbers' Company at Harrow saw the Master and Court supported not only by the elite of the plumbing trade (both

masters and operatives), but also by the President and ex-President of the Royal Institute of British Architects, by many medical officers of health Dr. Thorne Thorne (of the Local Government Board), Dr. Corfield, Professor Ray Lankester, Mr. Ernest Hart, Dr. Wynter Blyth, Mr. W. J. Diben (the chemist of the Metropolitan Board of Works), and numerous sanitarians and others whose professional co-operation and official sanction are of prime importance to the future progress of the movement. The Master's address was a well-reasoned and practical exposition of the policy of the company. He said: 'The Court of the Plumbers' Company have felt, from the very outset of the present movement, that, in order to effect its object and secure the efficiency of plumbing-work in dwelling-houses, it is essential that sanitarians, architects, builders, and plumbers should unite in a common effort. The institutions of each are represented upon the General Council, which is dealing with the matter, and the Plumbers' Company has done, is doing, and intends to do all in its power to bring the movement to a successful issue.' He, moreover, reported the definite success of the scheme of registration of plumbers, to which we have from time to time alluded. The words of the Master are worthy of notice. He said: 'The plumbers of the United Kingdom (both masters and men) have given, not only their general adhesion to the scheme, but hundreds have already applied to be enrolled upon the company's Register for Plumbers. Every applicant has to give some evidence of experience, and every application comes before a thoroughly representative, qualified, and impartial committee.' This announcement was followed by one of corresponding importance, from Mr. Philip Magnus, Director of the City and Guilds of London Institute for the Advancement of Technical Education, who expressed the hearty co-operation of that Institute with the Plumbers' Company, and gave some interesting information as to the formation of special classes for the technical instruction of plumbers. Mr. Magnus quoted, as evidence of progress, comparative returns for the sessions 1885-86, showing that in the former session the total number of students learning the scientific principles underlying the craft of plumbing was 148 only, and in the latter session 329, while the number of students who submitted themselves for examination was 87 last session, and 210 in the present session. The Master, in concluding his address, said: 'Though our work is necessarily arduous, our programme is a very simple one, and our immediate objects may be classed under these three heads: (1) Registration, so that the public and plumbers themselves may know who have, and who have not, given evidence of qualification. (2) The technical education of plumbers to compensate, as far as may be, for the falling off in the apprenticeship system. (3) The recognition by architects and the authorities of the necessity for more closely particularizing and supervising plumbers' work, especially in new houses.' The first and second of these objects may be said to have been already, in a measure, attained; but the attainment of the other remains dependent upon the voluntary action of architects and the sanitary authorities. It would, therefore, be over-sanguine to anticipate any considerable measure of progress without special legislation making the employment of qualified plumbers compulsory. Registration may, and we believe will, do something to prepare the way for that legislation. For one thing, it will, to a certain extent, determine the number of qualified plumbers in the trade, and it will also do something toward establishing a system of examinations by which to test the qualification of men desiring to enter the trade hereafter. But we can only look upon these things as tentative and preliminary to larger changes. Plumbers must be brought under official recognition and legal control analogous to that which prevails generally in the professions and crafts affecting the public health. The requisite legislation might readily be incorporated with a measure based on the lines of the bill introduced last session by Dr. Farquharson, for the 'Better Sanitation of Dwelling-houses'; or a short bill might be introduced based on the acts regulating the practice of apothecaries, dentists, etc., and constituting the Plumbers' Company the examining and certifying body; or the necessary powers might be provided by enlargement of the several local management and building acts. These are, however, matters of detail which we need not at present discuss. The first consideration for all is obviously the necessity which exists for legislation to follow promptly upon, and extend the scope of, the voluntary progress which has been made by the enlightened action of the General Council on Plumbing and the Court of the Plumbers' Company."

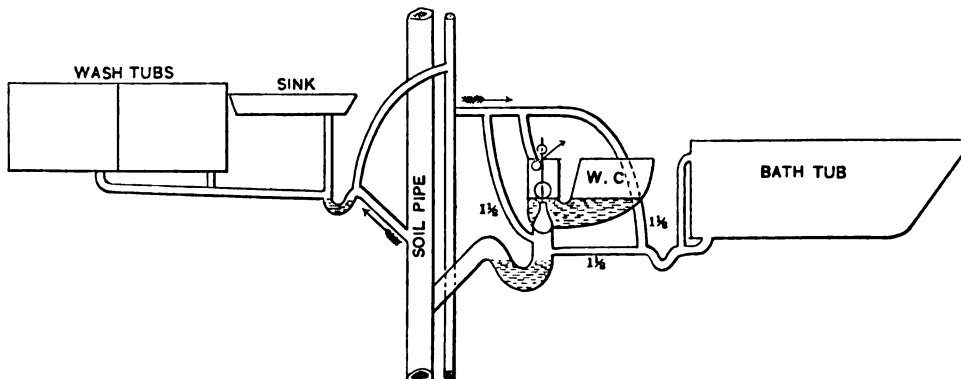
Correspondence.

A BY-PASS AROUND A WATER-CLOSET TRAP.

NEW YORK, July 29, 1886.

SIR: The accompanying sketch may be interesting as showing one of the many blunders that are continually being made in ventilation by plumbers, and even architects, for in this case I understand the architect was to blame for the arrangement of pipes.

The illustration shows a water-closet ventilated both from the receiver and the space above the trap, so as to



make a "by-pass" around the water-closet trap—the bath-waste making a second "by-pass."

This represents one of four floors in a tenement-house. Very truly,
"H."

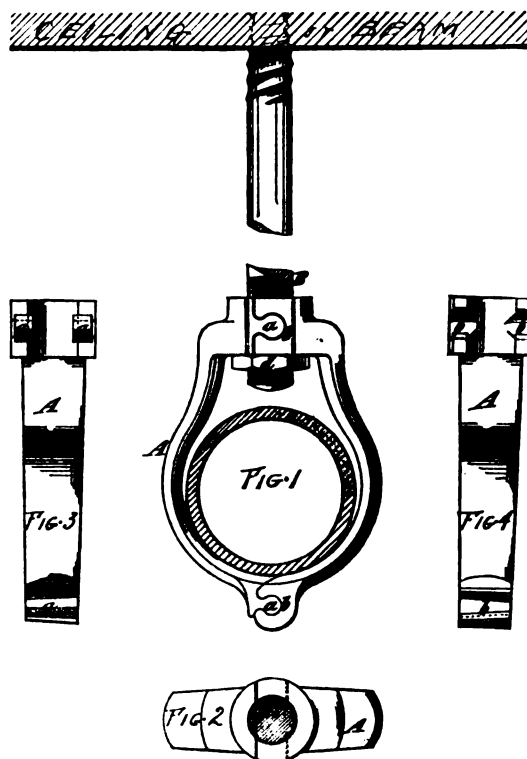
[This making of by-passes is a fruitful cause of serious defects in plumbing-work. The remedy is the plotting of the work on paper and earnest intelligent study of the pipe-connections which it is proposed to make. In "Plumbing Problems" we have collected a number of curious cases of this blunder, study of which ought to put a plumber or architect on his guard against their occurrence in any work designed by him.]

Novelties.

Under this heading we propose to describe and illustrate appliances of probable interest to our several classes of readers. The selection will be made without reference to the wishes of agents or patentees, being governed solely by considerations of novelty, ingenuity, and probable interest to readers, and especially the fact that they have not been elsewhere described. As a rule we shall make no comments, and it is to be distinctly understood that a notice does not imply approval. No charge will be made for these notices, and any offer of pay for their insertion will insure their omission. We shall be glad to have our attention called to novelties suitable for this section.

PIPE-HANGER.

THE accompanying drawings show a novel pipe-hanger for iron pipe lately patented by John T. Kelly, of the Kelly & Jones Company, of New York.



It relates to hangers which are employed for suspending steam, gas, or water pipes, and which consists, essentially, of a stirrup portion which surrounds the pipe and a bolt or screw to secure the stirrup at its upper end to the floor-

beams, ceiling, or other support. The principal object of the invention is to provide a hanger which is simple and inexpensive in construction, and which may be readily applied to lines of pipe already up and connected.

It consists, essentially, in the combination of a vertically divided stirrup composed of separable sections, one of which is provided at its upper and lower portions with dovetailed tongues which extend transversely to the length of the stirrup and the other of which is provided with correspondingly dovetailed grooves or recesses, which also extend transversely to the length of the stirrup and paral-

lel with said tongues, and a screw-bolt, by which the stirrup is supported. This construction of the two sections of the stirrup enables them to be connected or disconnected by a sliding movement of one relatively to the other in a direction transverse to the length of the stirrup and parallel with a line of pipe which the stirrup is to support.

In the accompanying drawings, Fig. 1 is an elevation of a hanger; Fig. 2 is a plan including a horizontal section of the sustaining bolt or rod to which the stirrup is attached; and Figs. 3 and 4 are respectively face views of the two sections of the stirrup.

Gas and Electricity.

Illuminating Power of Gas in New York City.

Week ending	New York Gas-Light Company.	Manhattan Gas-Light Company.	Metropolitan Gas-Light Company.	Mutual Gas-Light Company.	Municipal Gas-Light Company.	Krickerbocker Gas-Light Company.	Equitable Gas-Light Company.
July 24	26.51	22.17	21.42	30.66	29.80	21.69	30.26

E. G. LOVE, Ph.D., Gas Examiner.

A SO-CALLED CHEAP GAS.

A CORRESPONDENT at Montreal sends us a clipping on "Cheap Gas," cut from the Toronto Globe. It is the same old humbug—making hydrogen from zinc and sulphuric acid, only in the present instance "oyster shells" are added. The latter furnish carbonic acid gas, which is about the worst thing that could be introduced into an illuminating-gas. The man who is trying to interest the Canadians in this scheme says the "system" has been introduced in New York, Brooklyn, Boston, etc.

The reporter says that from the apparatus "a clear, straw-colored flame issued with wonderful steadiness, lighting up the room." As hydrogen burns with a bluish flame, and carbonic acid gas does not burn at all, the reporter must have been mistaken in what he saw, or he lost some feature of this beautiful invention. The showman says, "there is no oxygen in this gas, and the consequence is that it cannot freeze." Unfortunately, he does not tell us what oxygen has to do with the freezing of the gas. Moreover, if there was oxygen or air in the apparatus, the lighting of that "clear, straw-colored flame" would blow the whole thing to pieces. Very likely the gas don't freeze, but instead, and preferably, the machine itself freezes.

Our advice is, let it alone, but if you will "fool" with such things increase your life insurance.

THE ATTORNEY-GENERAL ON THE DISSOLUTION OF THE CONSOLIDATED GAS COMPANY.

ATTORNEY-GENERAL O'BRIEN last week gave an opinion on the application of the Gas Consumers' Association, of this city, for the dissolution of the Consolidated Gas Company,

denying the application. He holds that the question which he was asked to pass upon—viz., whether the property, rights, and franchises of the six companies which entered into the consolidation were equal to the sum named as the capital stock of the new company—is a question of fact which must be determined by a jury, and he doubts whether any good result would follow the dissolution of the company.

The opinion proceeds: "It seems to me to be a reasonable and fair construction of the statute to hold that, in case the trustees of the several companies intending to consolidate acted honestly and in good faith and placed a valuation upon the property, franchises, and rights which it was their duty to estimate and appraise, and thereby fix the capital of the new company, the corporation thereby formed would not be subject to dissolution or destruction if it was subsequently ascertained or could be established that the trustees signing the agreement were mistaken in their estimate of value. It might be that either by judicial proceedings or by legislative action the capital of the new company could properly be reduced to the value of the property and rights of the old companies, but it would seem to be manifestly unjust to subject it to destruction under the circumstances. There are other reasons which seem to me to require the denial of this application. It appears in the papers presented to me that the Consolidated Gas Company furnishes gas to more than 100,000 consumers; that the tax paid by it in the city of New York amounts to more than one-sixtieth of all the taxes paid in that city; that it owns and uses for the distribution of gas more than 700 miles of mains; that the amount of taxes paid upon its franchises to the Comptroller of the State exceeds \$30,000; that more than 1,000 shareholders have subscribed and acquired shares of stock since the consolidation, amounting in the aggregate to 100,000 shares, representing \$1,000,000. It furnishes gas, as I understand, for lighting the streets and public institutions of the city. An action by the Attorney-General, if proper at all, would necessarily have to be followed by an injunction restraining the business of the corporation, and the appointment of a receiver; and I cannot believe that the public interests require any such proceeding on my part, especially after a thorough and exhaustive examination on the part of the legislature, and a report to the effect that the company was regularly and legally formed."

THE Edison Electric-Lighting Company, of Detroit, Mich., has purchased a lot at the corner of State Street and Washington Avenue, and will erect thereon a large factory. The company will bury its wires underground at the outset. The total cost of the plant is given out at \$200,000.

THE report of the Chief Gas Examiner for London for the quarter ending June 30 shows that the gas of the Gas-light and Coke Company is tested at thirteen stations, and had an illuminating power of from 16.5 to 17.0 candles. The gas of the Commercial Company is tested at two stations, while that of the South Metropolitan Company is tested at four stations. The illuminating power of the gas of these two companies ranges from 16.3 to 16.9 candles, as the quarterly averages.

THE Council of Cleveland, O., have now under consideration an ordinance to compel the telephone and telegraph companies to lay their wires underground. On the 27th inst. the representatives of the different companies met the Judiciary Committee of the Council, Messrs. Burton and Ong, when the legal aspects of the case were discussed. The representatives of the companies maintained that under existing laws and charters the city could not compel the laying of wires underground.

THE petroleum-wells in China occur in the province of Ssetchouen, and are thus described by L'Abbe Huc: "When a salt-well has been dug to a depth of 1,000 feet, a bituminous oil is found in it that burns in water. Sometimes as many as four or five jars of 1,000 pounds each are collected in a day. This oil is very fetid, but it is made use of to light the sheds in which are the wells, and the cauldrons of salt. The mandarins, by order of the Prince, sometimes buy thousands of jars of it, in order to calcine rocks under water that render navigation perilous.—*London Engineer.*

THE Spooner bill, relating to the management of gas companies in the city of Washington, was briefly referred to in a recent issue. It fixes the price of gas at \$1 per 1,000 cubic feet, and provides for the appointment by the Secre-

tary of War of a board of three persons to investigate (1) the character of gas usually furnished in the city of Washington by the Washington Gas-Light Company, with especial reference to its healthfulness to consumers; (2) the general subject of gas manufacture and the methods and processes which produce the best gas for common use, regard being had to the health of consumers, illuminating-power, and economy; the cost per thousand cubic feet at which such gas can be manufactured and distributed in the city of Washington, with estimates of the cost of the requisite plant for such manufacture; whether it is expedient for the Government to manufacture and furnish gas for its own use and for the use of consumers in said city; whether the gas-plant now in existence in said city is adapted to the manufacture of such gas, and the fair value of the same, and what the cost would be of duplicating the same or so much thereof as might be necessary; (3) the actual fair cost per thousand cubic feet to the Washington Gas-Light Company of the gas manufactured by it and furnished to the Government and to other consumers in the city of Washington, or of such gas as said board shall find should be furnished by said company under the law; (4) the best system of gas inspection, and the best method of protecting consumers against unfair measurements of gas furnished, and against violations of law as to the purity and healthfulness of gas; whether a reduction of the price of gas in the city of Washington has been followed by a corresponding reduction in the bills of the consumers, and whether any method is or has been in use in said city whereby illuminating-gas not furnished has been charged for; (5) such information upon the general subject in its relation to the interests, hygienic and otherwise, of consumers in the city of Washington, and its relation to the interest of the Government, as shall be indicated by the Secretary of War from time to time, pending the investigation by said board. If at any time the gas company shows to the Secretary of War that the price fixed in the bill is not sufficient to permit the company to make a net profit of seven per cent. upon its capital stock of \$2,000,000, the Secretary, upon finding by the board that the statement of the company is correct, is directed, with the approval of the President of the United States, to fix a higher rate which the company may charge for gas, the rate to be sufficient to yield the net profit of seven per cent.

VENTILATION OF STOREHOUSES TO PREVENT ODORS FROM SWEATING GRAIN.

A FOUL smell proceeding from certain large storage warehouses on the East River water-front of Brooklyn, the Health Commissioner appointed a committee of four physicians, including the chemist of the department, to investigate and report. They found the odors to be due to about 1,000,000 bushels of corn which was sweating, and as a removal of it would be out of the question, because this would require a long period of time, during which the odors would increase, they determined to try the effect of ventilating the storehouses. In their report they say on this point:

"The only possible way of reducing the odor which appeared practicable was by a more thorough ventilation of the storehouses, four in number. It is believed that by thus diluting and cooling the air from the grain during the day it may be made much less offensive and by closing the windows during the night very little of the odor would escape. Our first recommendation was to thoroughly ventilate the stores by drawing the air through a large fan in one of the towers. This was tried, but although the effect was marked it was not a decided success, owing to the large amount of space to be operated upon. Another suggestion that was made and carried out was to shovel over the top layers of grain in all the bins so as to facilitate the escape of steam and heated air and thus cool somewhat the upper portion of the grain. To further assist the ventilation of the stores, at our request the owners have put in large ventilating-shafts extending about eight feet above the roof of the storehouses. The effect of these shafts is certainly very marked, and we hope it will so reduce the odors as to make them of very little objection to the residents of that neighborhood. The superintendent and foreman of the stores have shown entire willingness to follow out our suggestions in the matter. The above represents the present condition of the stores, and as the matter is under daily surveillance it is believed that no more can be done at present until we have time to try the improvements above mentioned."

NOTES.

OUR correspondent writes to us from Detroit, Mich.: "Health Officer Dr. Oscar W. Wight has tendered his resignation to the Board of Health. The board is composed of three physicians, the Mayor, Controller, and President of the Police Commission. Two of the physicians are at loggerheads with the Health Officer, and he, rather than engage in an interminable conflict, has determined to retire. Just at this time the city is threatened with a small-pox epidemic, and Dr. Wight's retirement would be a calamity. The press of the city is unanimous in demanding the retention of Dr. Wight and the reorganization of the Board of Health, if necessary."

EAST MADISON, a little village in Maine, has recently been visited by diphtheria, and the State Board of Health has investigated the causes. The Secretary, Dr. A. G. Young, writing to the *Somerset Reporter*, gives the following advice on the treatment of cases, to prevent, if possible, the spread of the disease: "The first duty in this disease is prompt and strict separation of the sick from the well, employing special nurses and keeping these nurses from coming in contact with well persons, especially children. Exclude all 'go-betweens,' whether in the form of well-disposed but ill-advised neighbors, or in the form of cats and dogs. Remember that the breath and all the excretions of the patient carry the poison. This poison must be radically destroyed by fire or by thorough and unquestionable disinfection. Bear in mind that every piece of fabric which has been within the sick room may be the bearer of the contagion."

WHILE the Thirteenth Annual National Conference of Charities and Corrections was in session in St. Paul, Minn., recently, Ex-President Rutherford B. Hayes, replying to the address of welcome by the Mayor of St. Paul, said: "A large part of the great evils that afflict society and imperil its best interests vanish, or are greatly diminished, the very moment that they are thoroughly understood and their essential nature exposed. With the public judgment enlightened and aroused the true remedy is soon and easily found. Hence this organization styled the National Conference of Charities and Correction. Our statistical information on this subject is neither full nor exact. A careful estimate for the United States would probably show something like this: Requiring public care or control, 500,000; men and women employed in this work, 50,000; amount expended annually on this account by the public, \$75,000,000; value of property devoted to this use, \$500,000,000. The evils this society seeks to prevent, to remove, and to mitigate are at every door. No man's family is safely intrenched against them. Blindness, deafness, idiocy, and insanity have brought sorrow to many a happy home. The vices and crimes of the forsaken and the outcast often reach the manliest array of sons and the loveliest of daughters. Society is so compacted together, and Providence hath so ordained and doth so govern things, that whether we would have it so or not, we must be and are our brother's keepers."

ASSOCIATED PRESS dispatches give the following account of the death of a master plumber of Saratoga Springs, N. Y.: "On the night of April 22 last, George H. McPherson, a prosperous plumber, who had suffered from mental aberration for a short time, escaped from his house and disappeared. He avoided the watchman by leaping out of the window late in the night, having no clothing on except shirt and drawers. The weather was quite cold. The authorities offered a reward for his discovery, but all search proved unavailing. On the evening of July 10 two hunters, who were after woodcock in the vicinity of the Geyser Spring, discovered the body of a man long dead and almost decomposed. From the clothing the corpse was found to be that of the missing plumber. At the time of McPherson's disappearance, water covered the swampy ground where the body was discovered, and he had evidently died from exposure."

THE Syracuse, N. Y., Council has voted an appropriation of \$1,200 to pay the cost of an investigation of sources of water-supply by the State Board of Health. The board will begin the work immediately.

THE epidemic which has caused a great fatality at Pottstown, Pa., has now been declared to be due to the decomposition of a large snake in the spring from which the persons affected obtained their drinking-water.

CHANGES IN NEW CROTON AQUEDUCT OFFICE AND STAFF.

THE recently appointed members of the new Croton Aqueduct Commission of this city and Commissioner Rollin M. Squire of the Department of Public Works have seen fit to remove, against the protest of the old members, Mr. James W. McCulloh, their efficient and honest secretary, in order to appoint in his place Mr. John C. Sheehan, of Buffalo, who is known here only as a politician, the friend of John O'Brien, a contractor on the aqueduct work. Mr. McCulloh leaves the office to the regret of the honest citizens of the city.

Messrs. E. Sherman Gould and Frederick W. Watkins, division engineers on the new aqueduct, were removed, with complimentary resolutions, and Messrs. J. Imbrie Miller and Charles Pugsley were appointed principal assistant engineers. The gentlemen removed were efficient engineers.

Patents.

No. 344,253 is a patent for a steam-boiler, issued to William T. Davis, of Battle Creek, Mich., for the combination, with hollow rings connected by a series of upright tubes, of a steam-dome and water-chamber located centrally within the upper ring and a series of tubes, forming an upright boiler.

No. 344,270 is a patent for a water-closet or cistern valve, issued to Charles H. Harkins, of St. Louis, Mo. It is an improvement in ball-valves for tanks or cisterns.

No. 344,406 is a patent for a pipe-wrench, issued to Seymour A. Rouse, of Indianapolis, Ind., assignor to the Globe Tool Company, same place, for the combination, in a pipe-wrench, a handle-bar having a recess and shoulder and socket formed integral with said bar, and having ribs, jaw and grooves arranged to engage and slide upon said ribs.

No. 344,408 is a patent for a metallic lathing, issued to Benjamin Scaries, of Clinton, Mass., assignor to the Clinton Wire Cloth Company, same place. A sheet-metal hanger with flanges which embrace the beam, and a triangular-shaped furring-strip, said strip having flanges which are embraced by the flanges of a clamp which is grooved longitudinally and laterally to receive the warp and filling of the wires of the cloth; also as a new article of manufacture, a sheet-metal hanger for metallic lathing, said hanger being provided with a sheet-metal truss running longitudinally of its body, downwardly-turned flanges or lugs at or near its centre, adapted to embrace and support the furring-strip, and one or more upwardly-turned ends or flanges adapted to embrace the beam, substantially as set forth.

No. 344,418 is a patent for a plate-glass-window frame issued to Walton D. Smith, of Prophetstown, Ill., for the combination of an inner frame carrying the glass, an outer frame surrounding the inner frame and out of contact therewith, except at the abutments or jogs, and the facing-boards secured rigidly to one of the frames and movably to the other, whereby the outer frame may be moved slightly under pressure without affecting the inner frame.

No. 344,477 is a patent for a rock-drill, issued to George R. Cullingworth, of New York, N. Y., for the combination, with a divided head and undivided sleeve, forming a stuffing-box, and a divided gland and undivided gland-collar, the sleeve being provided at its front end with lugs or ears, of long cylinder bolts whereby the sleeve and head are secured in place, and the gland-bolts separate from and independent of the cylinder bolts and securing the gland-collar and gland in place relatively to the sleeve.

No. 344,483 is a patent for a pipe-hanger, issued to John T. Kelly, of Brooklyn, assignor to Kelly & Jones Co., of New York, N. Y., for the combination, with a vertically-divided stirrup composed of entirely separable sections, one of which is provided at its upper and lower portions with dovetailed tongues, which extend transversely to the length of the stirrup, and the other of which is provided with correspondingly dovetailed grooves or recesses, which also extend transversely to the length of the stirrup and parallel with said tongues, and a screw, bolt, or other suspension device by which the stirrup is supported.

No. 344,487 is a patent for a pipe-cutter issued to James W. Mahlon, of Brooklyn, N. Y., assignor of one-half to Elizabeth R. Martens and Frank A. Coombs, both of same

place, for the combination, with a body or frame comprising a horizontally-projecting foot portion and the cutter-holder and its operating-screw of a cutter or roller holder having flanges which embrace the foot portion and detachably secured on said foot portion, the said holder being constructed with an opening in its top over the foot, and cutters or rollers journaled in said openings.

No. 344,501 is a patent for an automatic stop-valve, issued to Louis Schutte, of Philadelphia Pa., for the main valve, closing in the direction of the current which it controls, its piston, and the cylinder for the latter, in combination with the auxiliary valve, controlling the action of a fluid on the piston to move the main valve, and a diaphragm or its described equivalent, controlled by fluid-pressure, to operate the auxiliary valve.

No. 344,559 is a patent for a draught-regulator for hot-air furnaces, issued to John R. Barker, of Chicago, Ill., for the combination, with a hot-air furnace and a pipe located in the hot-air chamber thereof, and provided with suitable air-inlet and outlet, of a perforated plug situated in one end of pipe, a second pipe located within said pipe and provided with an air-inlet, a draught-door for the furnace, and lever and chain-connections between said pipes and door.

No. 344,594 is a patent for a building-block, issued to Christian Popp and Ludwig Melchior, of Wilmington, Del., comprising, in combination, cinders, lime, glue, sand, plaster-of-paris, and cement, in certain proportions.

Nos. 344,670 and 344,671 are issued to Edward C. Morris, of Boston, Mass., for a compound plastic and wire-netting lining or finishing for partitions, which is a lining or finish for walls, ceilings, partitions, etc., of buildings, composed of a backing in part made of metal, such as wire-netting with meshes or a plate with perforations, and in part of fibers, animal or vegetable, in the form of a netting with meshes or perforations in reduction of the area of said metal meshes or perforations, in combination with a plastic material applied to said backing.

PERSONAL.

MR. W. D. CHAPMAN was recently elected City Engineer of Akron, O.

DR. CHARLES BUCKLEY has been appointed a member of the Rochester, N. Y., Board of Health.

NEW CATALOGUES.

MR. F. B. BANNAN, of Pottsville, Pa., has sent us his new catalogue, showing his improved radiators for various uses in direct and indirect steam and hot-water heating. A novelty is shown in the form of a stool-radiator for stores, etc., with seven feet of surface, with a stuffed or upholstered top, on which people are presumed to sit.

THE HAY & PRENTICE CO., 34 S. Canal Street, Chicago, have issued a pamphlet illustrating a few of their specialties, such as boiler-settings, welded wrought-iron boilers for hot water, grates, cast-iron radiators of late design both for direct and indirect heating and for steam or hot water.

Notes.

For works for which proposals are requested, see also the "Proposal Column," pages 221 and 222.

CONSTRUCTION.

PLANS WANTED.—Competitive plans are asked for by the Board of State House Commissioners of the State of Kansas, for the completion of the central portion of the State House at Topeka. They are to consist of first, second, and mezzanine floor plans, south and east elevations, and transverse and longitudinal sections, all to a scale of eight feet to an inch, size of plan to be governed by plans of basement story, already adopted, to be seen at the office of the board; style of architecture to be in harmony with the wings already built. The Board of State House Commissioners will employ skilled assistants to sit with them as an awarding committee, and will pay \$3,000 for the best plans submitted, and \$1,500 for the second best. The plans for which premiums are awarded will become the property of the State of Kansas, with the right to use the whole or any part or any modification thereof without further claim from the authors for compensation or employment.

Carefully prepared estimates of the cost of erecting and finishing the building will be required to accompany each plan submitted. Plans will be received until January 14, at the office of the Commissioners in Capitol Square, Topeka. E. B. Allen is secretary.

BRIDGEPORT, COURT-HOUSE COMPETITIONS.—In the competition for plans of the court-house building at Bridgeport, Conn., it was announced last Saturday that Mr. Warren R. Briggs, architect, of Bridgeport, Conn., was the successful competitor. Plans were also received from Palliser, Palliser & Co., of New York; Buchanan & Jones, of New York; Clarence S. Luce, of New York; Joseph W. Northrop, of Bridgeport; C. T. Beardsley, Jr., of Bridgeport, and V. Wyss, of Cleveland, O. It is stipulated by the committee that the cost of the building, according to the accepted plans, shall not exceed \$110,000.

TOLEDO, O.—The North-Western Asylum Board will advertise in a few days for bids on the additional buildings and improvements to the asylum plant. These include ice-house and refrigerator, bath-house, employees' and fire department quarters, barn and stable, covered ways, grading, and paving. The estimated cost is \$64,000.

NEW JERSEY WATER-SUPPLIES.—A syndicate has been formed by Mr. Frank Hoxie, of Paterson, it is said, which has gained control of the waters of Passaic and Morris Counties, and intends to build large works for storage of water-supply and sell to cities. A corner in water is said to be contemplated.

STEAM-HEATING WORK IN PROSPECT.—The Board of Education of Minneapolis, Minn., has decided to advertise proposals for indirect steam-heating apparatus and system of ventilation in 19 school buildings. The expense is estimated at \$1,000 per building. Plumbing-work also will be done. Rufus Cook is engineer to the board, on whose recommendation the work is done.

BISMARCK, DAK.—July 27 a public meeting voted in favor of issuing bonds to the amount of \$25,000 for water-works, sewerage, and other improvements.

MILWAUKEE, WIS.—The City Engineer thinks that a tunnel in Dane Place from the lake to the river would be the best plan to purify the river. The tunnel could be built for \$200,000.

The County Board has appropriated \$28,000 for new pumping works at Wauwatosa.

The Board of Public Works has been authorized to purchase 100 tons 24-inch cast-iron pipe at a cost not to exceed \$2,474.

MILWAUKEE, WIS.—A proposition will be made to the city by Dr. F. A. Morden and others, constituting a stock company, to erect garbage-furnaces and burn the city's refuse. It is intended to erect ten furnaces.

JERSEY CITY, N. J.—The citizens of "Lafayette" are agitating the laying of new sewers.

PORTLAND, ME.—There seems to be work in prospect in connection with the abolition of the Back-Cove nuisance, due to discharge of sewage into the harbor.

CINCINNATI, OHIO.—Bids for building and furnishing one pumping-engine of 6,000,000 gallons capacity in twenty-four hours for the Hunt Street pumping station, Cincinnati, Ohio, were opened July 27, and were as follows: Henry R. Worthington, New York, \$18,000; Dean Steam-Pump Company, Holyoke, Mass., \$18,200; The Holly Manufacturing Company, Lockport, N. Y., one style, \$42,000, another style, \$25,000; The Gordon & Maxwell Company, Hamilton, Ohio, \$30,000. Subsequently the contract was awarded to the lowest bidder, Henry R. Worthington, of New York.

CLEVELAND, O.—Proposals were opened by the County Commissioners July 30, for constructing the viaduct between the villages of Brooklyn and Brighton, length about 1,500 feet. The Act of Legislature providing for the construction limited the cost to \$40,000. The bids submitted are held to indicate that it can be constructed for that sum, as shown by the annexed lowest bids and other charges:

Iron superstructure, Buckeye Bridge Works, \$24,813.40; excavation for foundation, concrete, and masonry, Andrews & Doolittle, \$6,158.50; hand-rail, King Iron Bridge Company, \$1,822.50; embankment, West & Sweeney, \$1,080; oak timber, H. B. Carpenter, \$1,198.14; pine timber, G. P. Mills, \$725.91; relaying plank road, Strong Bros.

\$106; right of way, \$200; contingencies, 10 per cent., \$3,600; total, \$39,704.45.

For the iron superstructure, bids other than that of the Buckeye Bridge Works were: Variety Iron-Works, \$29,026.37; King Iron Bridge Works, \$26,230.50; Albert H. Wolf, Chicago, \$27,591.69.

For iron hand-rail bids, other than that of the King Iron Bridge Company were: Buckeye Bridge Works, \$2,535; Variety Iron-Works, \$2,306.25; Albert H. Wolf, \$2,475; Woodhill & O'Gorman, \$2,115; Van Dorn Iron-Works, \$2,790; Same firm, special design, \$2,250.

CLEVELAND, O.—Smith & Connors have received the contract, amounting to nearly \$25,000, for the plumbing, gas and steam fitting of the new J. H. Wade block.

Plans have been completed by the city engineer for a new iron and steel viaduct over Walworth Run on Pearl Street. The bridge will be in four spans, 57 feet wide. The total length will be 360 feet, and the height above the run 65 feet. Bids for building the bridge will be received by the Board of Improvements on August 7. A temporary trestle-work will be erected for the convenience of the public while the bridge is being built. Abrams & Farris's bid for the temporary structure is \$3,245, the lowest tendered.

BOSTON, MASS.—Bids for furnishing pumping-engines for high service were opened July 30, as follows:

BIDDERS.	\$-million gallon.	1/2-million gallon.	1/4-million gallon.
George F. Blake Manufacturing Co.	\$62,000	\$43,000	\$22,000
Quintard Iron Works	120,000	75,000	50,000
Gordon & Maxwell Co.	57,000	40,000	18,000
Davidson Steam-Pump Co.	60,000	34,000	21,800
H. R. Worthington	64,000	33,000	20,000
Holly Manufacturing Co.	50,000	53,000	...

For furnishing a pump for the West Roxbury service, the bids were: George F. Blake Company, \$2,172; Davidson Steam-Pump Company, \$2,316; Dean Steam-Pump Company, \$2,555; H. R. Worthington, \$3,150; Smith & Vaile Company, \$1,795.

INDIANAPOLIS, IND.—For building the new market building here the following bids have been received: Peter Routier, \$33,760; E. F. Gobel, \$33,564; Salisbury & Stanley, \$33,291; Junglaus & Schumacher, \$33,795; Shaver & Christian, \$32,239; M. K. Fatout, \$31,900; G. Ittenbach & Co., \$30,400; Nuerge & Reincken, \$30,206; J. A. Buchanan, \$29,295.

BINGHAMTON, N. Y.—The Bridge Commissioners have awarded the contract for the building of a new iron bridge over the Susquehanna River there, just east of the mouth of the Chenango, to the Berlin Bridge Co., of Berlin, Conn. The appropriation is \$33,000. The company closed the contract for \$32,000. The bridge is to be finished by November.

MILWAUKEE, WIS.—Proposals for furnishing a pumping-engine and boilers with a capacity of 6,000,000 gallons daily were opened by the Board of Public Works, July 27, as follows: Henry R. Worthington, of New York, \$39,500; J. R. Maxwell & Co., \$26,000; E. P. Allis & Co., of Milwaukee, \$24,250, \$22,750, and \$22,250, according to style of engine.

NEW LONDON, CONN.—Proposals for building sewers were opened by the Sewer Department, W. H. Richards, engineer, July 22, as below. The contract has been awarded to P. F. Brennan. The amount of the contract is about \$19,000:

	P. F. Brennan, Waterbury, Conn.	John A. Gill, Boston, Mass.	M. S. Austin, New Britain, Conn.
	Price.	Price.	Price.
20" x 20" Brick sewer, per ft.	\$3.25	\$3.50	\$5.00
18" x 20" " " "	3.25	3.15	4.75
24" Pipe sewer, per foot	2.25	2.50	3.00
20" " " " "	.60	.60	.60
18" " " " "	.50	.75	1.75
12" " " " "	1.15	.90	1.25
Setting stand-pipes, each	1.25	1.00	10.00
Manholes, per vert. foot	3.00	3.00	3.00
Rock excavation, per cubic yard	4.00	4.00	4.00
Sheeting and bracing left in, per M.	15.00	20.00	20.00
Foundation plank, per M.	25.00	30.00	25.00

125 Remsen st; cost, \$7,000; o. F. L. Eames, on premises; a, W. B. Tubby; b, J. Thatcher and Martin & Lee.



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LIGHT AND LIFE.

THAT the amount of light to which living organisms are exposed exercises a powerful influence upon their development and growth is a matter of common experience. We are most familiar with the effects of comparative darkness upon certain plants—as in the blanching of celery, asparagus, and lettuce by this means, or the long white sprouts from potatoes kept in a dark and warm place—and the cause of this is to some extent known. The building of tissues from materials taken from without is in most plants effected by a peculiar colored tissue known as chlorophyll, and this tissue can only do its work when exposed to light. The material out of which the stem of the tree or the seed of the plant is formed is first compounded by the chlorophyll in the leaves, which latter organs, at the end of a bright day in the late spring or early summer, contain a large amount of such material. During the night this disappears, being carried by the sap circulation to the place where it is needed for construction. The leaves are, as it were, the brickmakers for all the building going on in the tree.

Through what special channels the influence of light is exerted on the animal organism, and especially on man, is not so clear, but it must be effected through the skin and eye, and through these it probably acts on the nervous system, and thus on the blood-making part of our machinery.

At all events, men living in dark habitations—and especially if this life be continuous, as was the case in ancient prison-cells, etc.—become blanched; the blood does not contain its due proportion of red corpuscles, and such men are said to be anæmic. The observations of sanitary inspectors and the results of comparing death-rates of different localities have, within the last fifty years, fairly demonstrated that dark habitations are unhealthy, that the mortality is greatest in those parts of a city where the houses are most densely packed, where the windows are but a few feet from a wall, and where, in the lower stories especially, direct sunlight can seldom or never enter. In streets running east and west it has been found that the people in houses on the north side of the street, living chiefly in rooms having a southern exposure with plenty of sunlight, are healthier and have a lower death-rate than those living on the opposite side of the street in an almost perpetual shadow.

It has, however, been very uncertain as to whether these differences were not largely or mainly due in many cases to other causes, such as want of fresh air, poverty, etc., and also as to whether the sanitary effects of light are due to its stimulating and invigorating influence on the human body, or to its in some way preventing the development of causes of disease external to the body.

The recent advances in our knowledge of the causation of certain diseases by minute vegetable organisms, and of the influence of light on the growth and development of these organisms, make it probable that it is through this latter

channel that light is especially important as a sanitary agent. The movements of many of the bacteria are strongly influenced by the amount and direction of the light to which they are exposed, and there is one bacterium the movements of which appear to depend entirely on the influence of light, and which has therefore been named *bacterium photometricum*. Every change of the color or of the intensity of the light to which it is exposed induces movements in this organism.

In general, it may be said that light, and especially bright light, hinders or stops the development of the bacteria. This action is exerted on the organisms themselves, and not on the nutritive material in which they flourish; that is to say, if a sterilized flask of culture fluid be exposed to the rays of the sun for several days, and then is inoculated with germs and placed in the dark, the germs flourish vigorously; while if a similar flask is kept for some time in the dark and then is inoculated and placed in the sunlight, the development of the germs will be greatly retarded.

Recent experiments made by Mr. Arlving indicate that in cultures of the *bacillus anthracis*, which is now positively known to be the efficient cause of splenic fever and malignant pustule, the rays of the summer sun rapidly stop the germination of the spores and hinder the growth of the threads, diminishing, also, their infective power. To use the technical term, they "attenuate the virus." The light of ordinary illuminating-gas appears to check the growth of the bacillus slightly, but its effects are very small as compared with those of sunlight.

The practical bearing of these results is evident, and if similar effects are found to follow from the exposure to light of other micro-organisms which cause disease—such, for instance, as the bacillus of tubercle, or the micrococcus of erysipelas—we have made a long step toward the obtaining of a scientific basis for preventive work, and it may be also for treatment. It is not necessary, however, to wait for further experiments to prove that plenty of sunshine is a good thing for all of us, and we are now in the season when it is easiest to take advantage of the flood of it which is pouring down upon the world costless and priceless.

THE necessity for stringent measures of repression of the present wasteful destruction of the forests on the slopes of the Rocky Mountains as a means of conserving the water-supply of the region is being amply verified by the short supply of water this season in the vicinity of Denver. Governor Eaton, of Colorado, has recently granted authority to the State Engineer and the Water Commissioners for the district to shut down the head-gates of the large irrigation ditches, only allowing enough water to flow to supply those dependent on them with water for domestic use. This was done in order that the farmers on the river below Denver might get water for a like purpose. This brings up the question of priority of right among the

several ditches. With the rapidly increasing population in the district the question of supply will become of more and more importance. The papers *now* speak of "suffering farmers, outrageous monopolies, indignation meetings, exasperated farmers," etc., and yet there are *surely* worse times coming in the future unless wise preparation and more careful conservation be the order of the day.

As a feature of the recent convention of the American Society of Civil Engineers, at Denver, which has not been mentioned in the reports, though well deserving notice, we desire to make especial mention of the admirable pamphlet presented to the visiting engineers by their brothers of the Denver society. It was by far the most complete and valuable of any heretofore prepared for like occasions, containing in considerable detail answers to all the questions a civil engineer would be likely to ask as to history, physical characteristics, meteorology, rainfall, tillable land,

by the *News*, the reality of the evil and the public spirit of the newspaper is not to be doubted. In the rage now existing for the publication in daily journals of the various countenance of public men and women—apparently on the principle, "you pays your money and you takes your choice"—the application of pictorial art to sanitary enlightenment is gratifying.

THE Harlem Bridge Commissioners are to be congratulated on the appointment of Mr. William R. Hutton, M. A. S. C. E., as Chief Engineer of the new Harlem Bridge. If they have sense enough to be guided by his advice they will be spared much worry and mortification, and they will have the satisfaction of knowing that their engineer is a gentleman who has the confidence of the profession in his ability to successfully carry out anything he undertakes.

and became a member of the class of 1869 of the Massachusetts Institute of Technology, in Boston. He gave special attention to chemistry, in which study he was remarkably proficient, and graduated in 1869. During his last year of study he assisted Professor Storer, and upon graduation he was appointed Instructor in Mineralogy and General Chemistry in the Institute. From 1870-72 he was Assistant Professor of General Chemistry, and in 1872 he was appointed Professor of General Chemistry, which position he held at the time of his death. He was an excellent teacher, and his systematic and careful instruction contributed in no small degree to the success of the school with which he was connected. He devoted special attention to questions relating to water-supply, and was known throughout the world as one of the most intelligent and conscientious experts in matters of this kind. The various reports of the Massachusetts Board of Health contain a great number of reports from his pen upon questions relating to water-supply, while his "Water-Supply, Chemical and Sanitary" (N. Y., 1883), has become one of the standard works upon this subject. He prepared, also,



A COUNTRY HOUSE AT MALDEN, MASS.—HARTWELL & RICHARDSON, ARCHITECTS.

agricultural and mineral statistics, climate; names and altitudes of towns, passes, and lakes; Denver sewer and water-works systems, artesian wells, with a full discussion of the strata penetrated by them, and their yield; narrow-gauge railroads of Colorado, with full details of track, curvature, mileage, cost per ton and passenger mile; building stone with tests, cement and fire-clay, coal, irrigation, etc. There were illustrations of various interesting details of sewer, railroad, and irrigation work, interesting views, etc., the whole forming a most readable pamphlet and furnishing a model which we hope may be copied in the future on like occasions.

DAILY press illustration has been put to a good use by the Elgin, Ill., *Daily News*, which shows graphically in a recent issue the close connection between the wells, cesspools, and privy-vaults of that city. While we may doubt that the cut was produced at "fabulous expense," as claimed

WILLIAM RIPLEY NICHOLS.

WE propose to supplement the brief notice of the death of Professor William Ripley Nichols, in our issue of July 22, by a fuller account of his life-work. To us his death came as a personal loss. For many years Professor Nichols had been a writer for THE SANITARY ENGINEER, and a trusted adviser on the subjects on which he was an authority. Hence we desire to record the disinterested fidelity and zeal with which he aided us by counsel and suggestion. Since 1882 he was an invalid, and his death followed a surgical operation for his relief. His last years, though fruitful in valuable scientific work, were years of pain.

William Ripley Nichols, Professor of General Chemistry in the Massachusetts Institute of Technology, at Boston, died at Hamburg, on July 14, from the effect of a surgical operation. He was aged 39 years.

After spending some time in study and travel abroad, Professor Nichols entered Harvard College with the class of 1869, but at the end of one year he withdrew

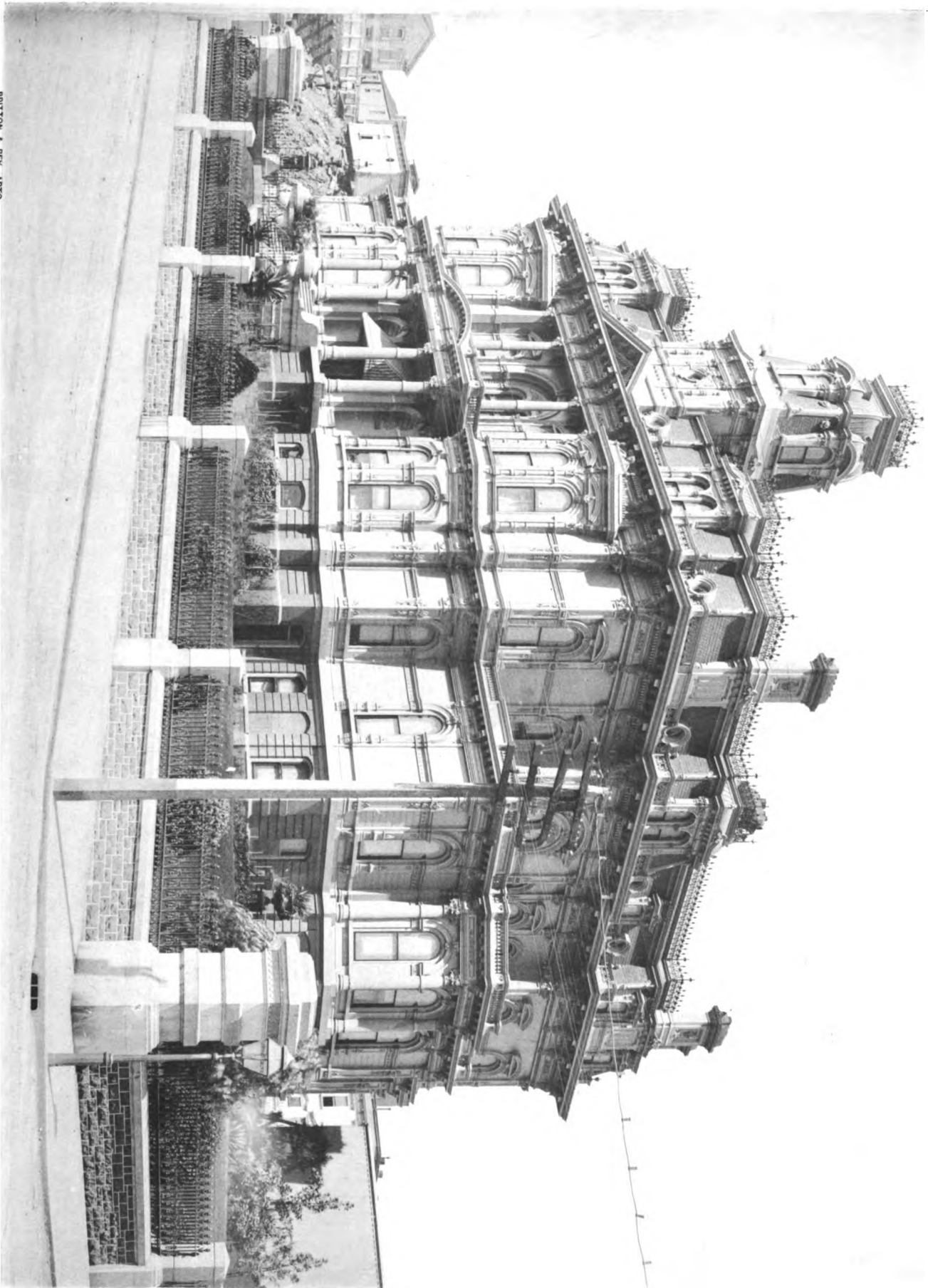
the article in "Buck's Hygiene," upon "Drinking-Water and Public Water-Supplies." He was also a frequent contributor from 1868 to the present time to various technical and scientific periodicals on numerous chemical and sanitary questions. He was the compiler of the revised edition of Eliot & Storer's "Manual of Chemistry," which has passed through many editions, and of the revised Eliot & Storer's "Manual of Qualitative Analysis." He was a member of numerous chemical and scientific societies. He was Vice-President of the Chemical Section of the American Association for the Advancement of Science in 1884-85, and prepared for this association his well-known address on "Chemistry in the Service of Public Health."

A professional friend writes:

"There never was a more faithful and conscientious man in the performance of all duties. In his death the Massachusetts Institute of Technology has sustained a severe loss. He has left a name and a character which shed a lustre upon his science, and upon the school in which he was educated, and in which the principal work of his life was performed."

Artotype, No. 6

With S. F. News Letter, April 23d, 1887.

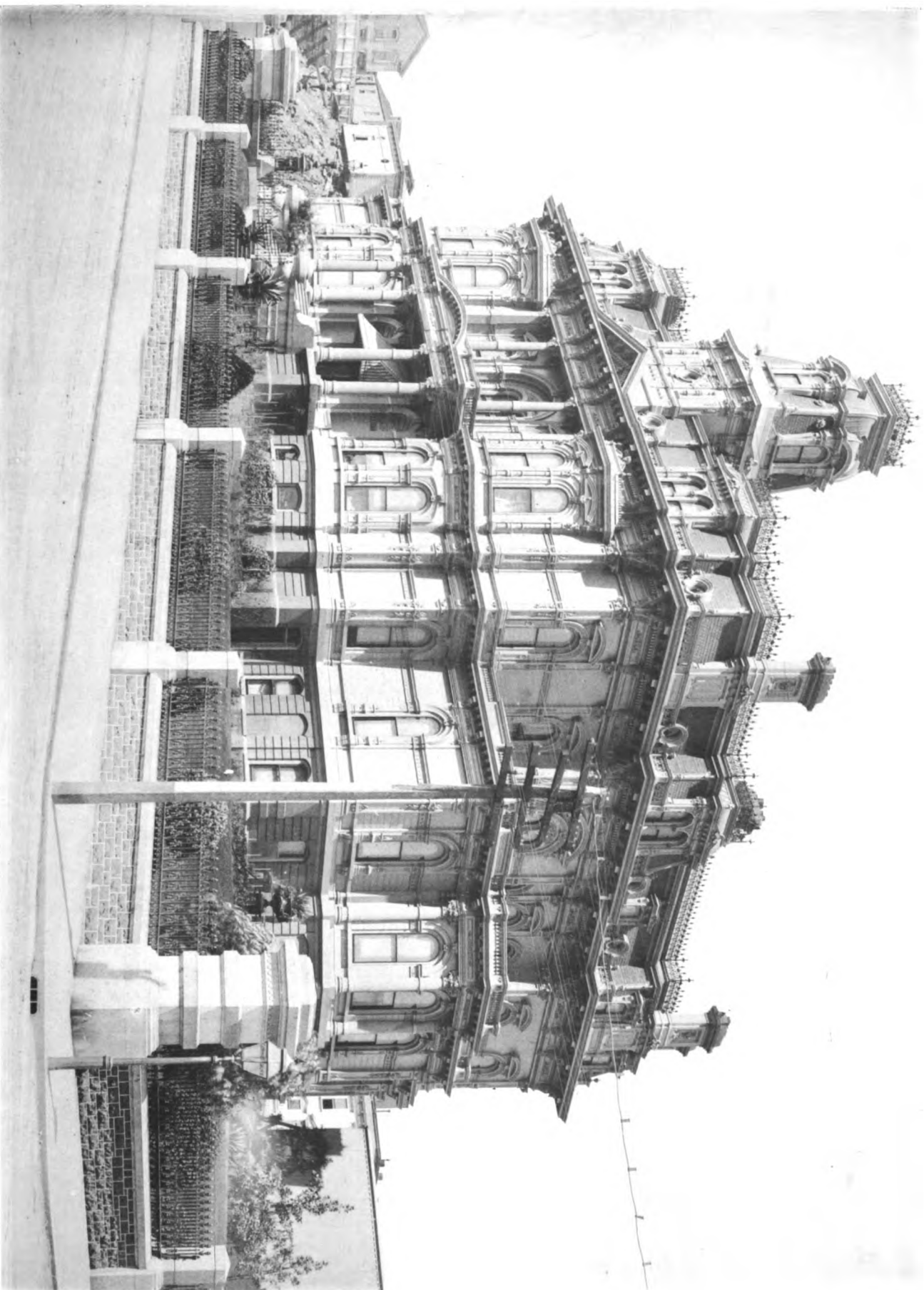


ARTISTIC HOMES OF CALIFORNIA.

Residence of Mr. CHARLES CROCKER, California Street, bet. Taylor & Jones Sts., S. F.

Artotype, No. 6

With S. F. News Letter, April 23d, 1887.



SMITH & REY, ARTO.

ARTISTIC HOMES OF CALIFORNIA.

Residence of Mr. CHARLES CROCKER, California Street, bet. Taylor & Jones Sts., S. F.

OUR BRITISH CORRESPONDENCE.

Flushing Private Drains at Newcastle-on-Tyne—The Blackmoor Water-Supply Scheme for Leeds—Political Appointment of Sanitary Inspectors—Unfortunate use of a Prominent Name.

LONDON, July 24, 1886.

THE Newcastle-on-Tyne health authorities and their City Engineer, Mr. W. G. Laws, have introduced a novel feature in their scheme of municipal engineering, which will commend itself to all. They undertake, for a stated charge, thoroughly to flush out and clear the drains and connections of any private householder, on receiving a requisition to that effect. The charge will be, for one house 4s. 6d. (£1.08), or, for six householders combined, 1s. 6d. each (36 cents). It is not a matter of surprise that a large number of the townsmen have already availed themselves of this very sensible offer.

The Leeds Corporation, in furtherance of a new scheme for the Blackmoor water-supply, referred the matter to Messrs. Hawksley and Bateman, the hydraulic engineers, of London. These gentlemen condemned the scheme submitted to them, the estimated cost of which was £90,000 (\$432,000), and, in place thereof, they offered their own, amounting to some £40,000 (\$192,000). I quote this fact as an instance of the advantage to be obtained by corporations submitting similar matters to engineers who are specially in the particular branch of reform required, as opposed to the "penny wise and pound foolish" system, that is so often adopted by the local authorities, of employing their own engineer. This gentleman may be capable, and generally is an able man, competent to cope with the general questions that present themselves in municipal engineering, but it is, of course, generally impossible that he should stand on a par with those who make any special branch a life study.

Instances are continually cropping up illustrative of the absurdity of the existing state of affairs governing the appointments of sanitary inspectors. The association will do not only themselves a service if they can obtain satisfaction for their claim that appointments should be subject to examination, but they will at the same time be protecting the public. That appointments to such posts should be in the hands of local vestries and sanitary authorities, without regulations to govern same, is a loss to the public. They should, without doubt, be made by a central bureau, such for instance as the Local Government Board, and equally without doubt should it be insisted that qualified men should have preference over those whose possession of a friend, or sundry friends, at court is their only recommendation. This power of local authorities to appoint their own officers applies also to the medical officers, and gives rise to some funny contests. For example, a case has just occurred at Macclesfield, in Yorkshire—a Liberal borough—in which the politics of the candidate has decided the matter. The Conservative candidate was recommended by the sub-committee appointed by the Town Council, on the casting vote of the chairman, but the Town Councillors objected, and elected the Liberal, the various partisans voting "solid."

It is a pity that a man posing as a public benefactor and philanthropist should allow his name to be used in such a manner as to give it a marketable value. I see a filter has been put upon the market here bearing the name of M. Pasteur, the manufacturers stating that they are sole concessionaires of the patentee, and producing letters to that effect.

SAFETY-VALVE.

OUR SPECIAL ILLUSTRATION.

THE COURT OF THE GREAT MOSQUE AT DAMASCUS, SYRIA.

THIS great mosque, one of the most important ever erected, was begun in the year A. D. 705, by the Caliph Walid, and completed in ten years. It was built on the site of a previous Christian church, which was destroyed to make room for it. Though its arrangement is Moslem, in detail its architecture is Byzantine, architects and masons having been procured by the Caliph from the Emperor of Constantinople. "The mosque itself," according to Fergusson, "has three great aisles nearly 500 feet long, running east and west, separated from one another by pillars borrowed from the earlier Christian or Pagan temple which stood on this spot. Their continuity is broken in

the centre by a transept raised higher than the rest, and supporting a small dome in its centre. The south wall has the usual niches to indicate the direction of Mecca, and above these there is a range of circular-headed windows running the whole length of the mosque. To the north the mosque opens by a series of arches supported on pillars to a court-yard about 500 feet long by half that in width, surrounded by a colonnade on three sides, the whole apparently consisting of Christian materials, but entirely rearranged by the Moslems." It is this great court which is shown in our illustration. The tower in the background is known as the Minaret of the Bride.

OUR ILLUSTRATION OF A MODERATE-COST HOUSE.

A COTTAGE AT MALDEN, MASS.—HARTWELL & RICHARDSON, ARCHITECTS.

THIS house is the residence of Mr. S. M. Fairfield, at Malden, Mass.; the cost was \$4,500. The architects are H. W. Hartwell and William C. Richardson, of Boston.

THE ARTESIAN WELLS OF DENVER.

THE matter of obtaining water from subterranean sources is of such general and increasing importance that it seems worth while to refer at length to a report upon the subject as it applies to Denver, made by a committee of the Colorado Scientific Society, consisting of Witman Cross, Frederic F. Chisolm, Regius Chauvenet, and P. H. Van Diest. Their report is embodied in the pamphlet furnished the American Society of Civil Engineers by the Denver Society of Engineers, from which we condense as follows:

Denver and the plains about it are underlaid by sedimentary rocks of Silurian, Carboniferous, Triassic, Jurassic, and Cretaceous ages. Owing to a sharp folding of these strata at or near the contact with the Archean granites, gneisses, and schists of the foot-hills which extend nearly the whole length of the Colorado range of the Rocky Mountains, each stream of water issuing from the mountains has exposed a more or less perfect section of the series.

The strata of the Laramie or lignite group are found to immediately underlie the surface at and about Denver, and unless the wells of Denver have penetrated this group it is plain that the question becomes a study of the character and extent of that formation. The United States geological survey has shown that the Laramie is overlaid by another formation, which is easily recognized, the difference being this: the sandstones and conglomerates of the Laramie are made up of minerals and rock fragments derived from the granites and gneisses of the main range to the west, while the latter formation is composed of pebbles and fragments of eruptive rock of the andesite group, one of the most pronounced Tertiary rocks.

The water-bearing layers are found in the Laramie group. This formation is one of the most variable known as to the character of a given stratum at different points or the sequence of the strata. The thickness is 1,200 to 1,500 feet, its base consisting of a persistent sandstone series, 300 to 600 feet thick, composed at the top of fine conglomerates and heavily iron-stained layers, and near the bottom containing the workable layers of coal. Above this sandstone series comes a series of alternating clay and sand strata of very variable composition and thickness of layers. It is evident, therefore, that no calculation can be made as to the thickness to be passed through in boring.

The deepest well yet sunk in Denver strikes iron-bearing water at 900 feet. At Golden, about twelve miles westerly, the depth to be bored is 1,200 to 1,500 feet.

The greater the number of sandy layers passed through the greater the number of flows of water and the greater the pressure. The area within which wells may be obtained is practically identical with the coal-basin. The natural streams and the ditches leading from them, pass over the upturned edges of the porous sandstones at an elevation of from 200 to 600 feet above Denver; for example, on the east the outcrops on Box Elder Creek are elevated some 400 feet. The shape of the artesian basin is oval, the major axis corresponding nearly with the Platte, and being about fifty-six miles in length, and the minor axis being about thirty-two miles long; Denver being situated probably above the lowest part of the fold.

In general, it may be stated that at any locality, if the Laramie formation be present, with upturned edges along

the base of the mountains, the chances of obtaining an artesian well are good; but if the lower members of the cretaceous form the surface, the chances of obtaining a supply are doubtful.

The bottom member (sandstone) of the Laramie group has not yet been reached, but it probably contains a large supply of water at a depth of about 1,500 feet. It is probable, also, that water obtained from lower horizons than the Laramie will be less pure, since the lower beds abound in soluble salts, such as sulphates of soda and lime, etc. At Greeley, for example, such a well yielded water contaminated with oil.

The first well was sunk at East Denver in 1874, and to a depth of 795 feet. Water-bearing seams of sand rock were cut by it at depths of 255, 540, and 780 feet, but none gave pressure enough to bring the water to the surface, and the well was abandoned. In an experimental sinking for coal made in March, 1883, in North Denver, there was such an abundant flow of water from the boring as to force the abandonment of the original enterprise. This water was characterized by extreme purity, and was much superior to the supply from the Platte River. As soon as it was determined that the well was truly artesian (restricted to the rightful use of the word, that is, a *flowing* well) a large number of others were sunk, and in June, 1884, there were about eighty flowing wells, with an average discharge of twenty-five gallons per minute, or about 2,880,000 gallons per day of twenty-four hours.

There is a great difference noted at different wells as to the strata passed through and the pressure of the water. In some cases six or seven layers of sandstone have been passed through, and in others but one. In one case a stratum of sandstone seven feet thick was struck at 210 feet, but it was compact and did not furnish sufficient pressure to bring water to the surface. Five blocks away this same seam was forty feet thick, composed of loose sands, and water flowed from it freely over the surface. The stratum generally struck at 235 to 275 feet furnishes a fair supply of flowing water, but the wells do not always flow.

The seams at 375 feet and 600 feet so uniformly flow that they are called the 375-foot and 600-foot flows; but the pressure varies greatly at different wells—that from the first averages at present about ten pounds per square inch, and from the last about twenty-eight pounds. The greatest flow is usually from the bottom of the bed, increasing as the bottom is approached by the drill.

The following strata were bored through in a well on Colfax Avenue:

A seam of gravel and surface-wash.....	12 feet.
Clay.....	17 "
Sandstone.....	1 "
Hard clay.....	94 "
Hard sandstone.....	8 "
Clay slate.....	22 "
Sandstone (first flow of water).....	14 "
Hard clay.....	24 "
Sandstone.....	2 "
Very tough hard clay.....	50 "
Sandstone (second flow of water).....	16 "
Hard clay.....	30 "
Sandstone (third flow of water).....	10 "
Blue clay.....	8 "
Sandstone (fourth flow of water).....	12 "
Soft clay.....	15 "
Dark hard clay.....	15 "
Loose white sandstone (fifth and greatest flow).....	25 "

Total depth bored.....375 feet.

It will be seen that the water-bearing sandstones were first struck at 154, 244, 290, 308, and 360 feet, respectively.

The pressure is found to be growing less as more wells are bored. For example, the well in the Charles Block at the corner of Curtis and Fifteenth Streets was the first to reach the 600-foot flow, and for a time had a pressure of from sixty-eight to seventy-one pounds per square inch. To-day the average is but about twenty pounds. When the Fisher well reached the same flow the pressure at the Charles Block well decreased to ten to fifteen pounds, afterward recovering. When the McClelland well was completed the Charles Block well ceased flowing for a day, increasing to about ten pounds, until the connections for the other wells were made, when it increased to the average mentioned (about twenty pounds). The pressure is greatest during the night.

In another case a well was sunk to 555 feet, and gave a flow of ninety-five gallons a minute; a second well 250 feet away, reaching the same sand, reduced the flow of the first by about one-third; and a third well at 250 feet from

each of the others so reduced the flow of the first that the combined flow of the three but slightly exceeded that at first obtained by the one well. Another well 1,500 feet away seemed to have no effect upon the three wells. In a few of the wells, tapping the 375-foot flow, an increase in pressure has been noticed, but the time has not been great enough to allow positive statements to be made.

The volume of flow increases with the diameter of the bore-hole, and holes of larger diameter are recommended, especially for deep wells, but the report nowhere gives the diameter of the present wells. Much water is lost by imperfect casing, the water escaping into the upper seams, and not reaching the surface. In one well for example, 390 feet deep, of which 200 feet were cased, the pressure has gone down to two pounds, from an original pressure of thirty-two. The pipes need to be carefully packed with seed-bags or other suitable packing, and only sound, well-tested pipe should be used.

Analyses are given of the water from three wells, showing solid residues of ten to eleven grains per gallon, consisting mostly of carbonate of sodium. One other well gives thirty-three grains per gallon, consisting of carbonate and chloride of sodium.

The total area of the Denver basin is given at 12,125,232,200 square feet, with an average rainfall of $14\frac{1}{2}$ inches. On the supposition that twenty per cent. (the Paris basin is given by scientists at twenty-three per cent.) enters the earth, there would be a supply of about 22,000,000,000 gallons per year.

It is thought that the large seepage from the irrigation ditches must add 6,000,000,000 gallons more per year, giving a total per day of about 79,000,000 gallons. On account of the dip of the rocks to the north much of this passes away from Denver, but if only ten per cent. is available, there still remains 7,700,000 gallons per day, or enough for a population of 150,000 persons at fifty gallons per capita.

The report gives the cost for drilling of the wells at about \$2 per foot. It does not state whether this includes piping, etc., but as the progress made is frequently seven and eight feet per hour, it must include the total cost of the well proper.

SEWER-VENTILATION.*

THIS paper contains a record of experiments at Chelsea on sewer-ventilation by down-draughts from cowls.

The experiments are not put forward as novel, but only as accurate observations under known conditions.

The sewer experimented on is in Jubilee Place, Chelsea. It is an egg-shaped brick sewer, 3 feet 9 inches by 2 feet 6 inches, with an inclination of 1 in 100. At the highest part it terminates in a dead-end, and at the other end joins a main sewer of the metropolitan system. At a point 600 feet from the dead-end a head-wall is built in the sewer, and under it a dip-trap to pass the sewage out. A safety-valve is fixed in the head-wall, to provide a means of discharge in the event of the dip-trap ceasing to act. The sewer is fairly well built, and receives the sewage of forty-four ordinary dwelling-houses, and the road-water from eight gulleys. The mouth of each of these drains is provided with a block-flap. The sewer was thus an elongated vessel, with a capacity of 4,300 cubic feet. The roadway above is practically level. Near the centre of the length of the sewer a 15-inch pipe is inserted at springing level, and is connected to a shaft against the side of a house. The shaft terminates at the parapet wall, and has on the top a lobster-back cowl, so arranged as to present its mouth to the wind. The mouth of the cowl is 15 inches in diameter, and the throat 9 inches in diameter. The height of the cowl above the road is 32 feet. At the dead-end a 12-inch pipe connects the sewer to a similar shaft against the side of a house opposite. This shaft terminates at a height of 22 feet above the level of the road, and is made to resemble a chimney-stack, surmounted with a 9-inch chimney-pot. At the lower end a 12-inch pipe connects the sewer to a shaft against the front of a house opposite, which terminates at the parapet with an open mouth, at a height of 31 feet above the level of the street.

The action of the system is simple. The wind, in passing the centre shaft, turns the mouth of the cowl toward it, and forces air down the shaft and through the 15-inch pipe into the sewer. It then divides into two currents, one

passing down the sewer and out by the shaft at the lower end, and the other up the sewer and out by the shaft there.

Four air-metres were used to measure the velocities of the air entering and leaving the sewer. One was placed in the mouth of the downcast pipe in the centre, where it joins the sewer; one in the mouth of the upcast pipe, where it joins the sewer at the lower end; one similarly at the high end, while the remaining one was used as a check-meter at each of these points in rotation. In every case the author entered the sewer and took the observations.

The following table shows the results. The experiments commenced on the 26th of February, and terminated on the 11th of April, both in 1885:

Number of Experiment.	Duration of experiment in days.	Average velocity of wind in miles per hour.	Volume of air entering sewer in cubic feet per minute.	Number of minutes taken to fill and empty sewer with air.	Number of times per day sewer was filled with air.
1	1	18.4	113	38	38
2	3	9.6	126	34	42
3	4	11.3	117	37	39
4	5	11.5	161	27	53
5	7	10.3	136	32	45
6	8	10.6	140	31	46
7	7	11.3	150	29	50
8	7	13.0	180	24	60
8	44	12.0	140	31.5	46.6

The fact that a sewer of this capacity had its gaseous contents changed every thirty-one and a half minutes during forty-four days, by the force of the wind on a self-acting cowl, will probably be considered a satisfactory one. As a matter of fact, one-third of the theoretical volume of air which would have passed through the throat of the cowl at the velocity of the wind, if there had been no resistance or loss by friction, did actually pass through the sewer.

The influence of this volume of air on the interior of the sewer is beneficial. Instead of the slimy coating of bluish-white matter that adheres to the crown and sides of sewers ventilated by openings in the roadway, there is dryness for at least 1.0 feet on each side of the downcast shaft, and then a gradually-increasing dampness is found until the upcast shafts are reached. At these points the crown and sides of the sewer are damp, but the moisture is clean as compared with that of an ordinary sewer.

The air passing out of the upcast shafts has a very slight smell of sewer-gas. No complaints have been made as to it, either by the occupiers of the houses against which the shafts are placed or by the neighbors, or by persons using the street.

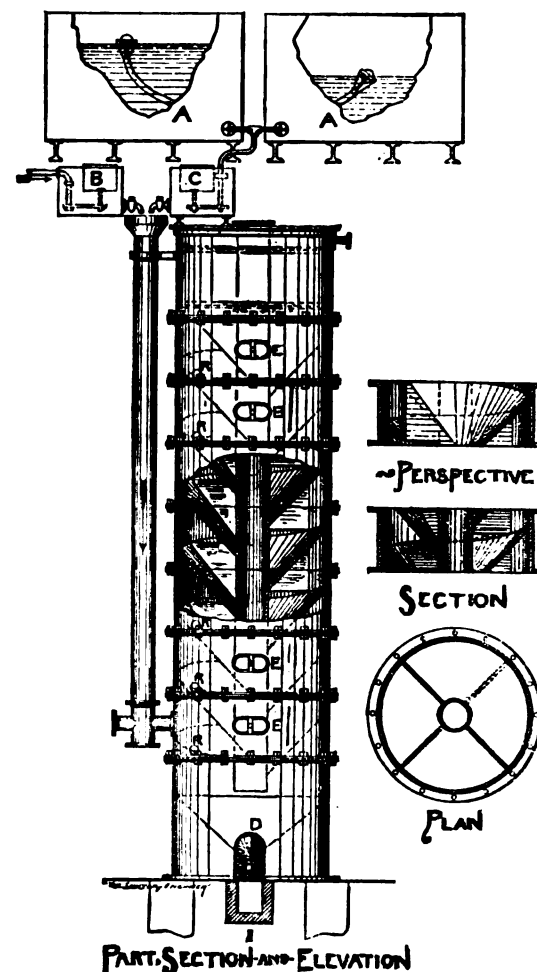
The method of forming the shafts deserves mention. They are built against the walls of the houses, and are made of concrete. The pieces are molded to a rectangular gutter-shape, with a face 12 inches long and sides 6 inches long, so that when placed against the wall which forms the fourth side, a space 12 inches by 6 inches is enclosed. The sides are 1 inch thick. Near the end of each of the short sides a hole is molded vertically through the piece, so that when the pieces are placed against the wall it exactly coincides with the eyehole of a hold-fast driven into the wall. A stout wire is passed through these holes and eyes, and by this method the pieces are threaded to the building. The joints are made good with cement. As the outside of the shaft is marked to correspond to the courses of brick-work, it looks a part of the house, presenting the appearance of a pier. Where necessary, moldings are placed to further improve it.

It occurs to the author that the system might be usefully applied by fixing a cowl and shaft, of suitable sizes, at the rear of houses, connected with the house-drains. The air would pass through the house-drain into the sewer, and out of upcast shafts placed at suitable intervals. By this means the house-drains, as well as the sewer, would be ventilated. This method would do away with the necessity of the deep syphons now fixed in house-drains to protect the house from sewer-gas, which the author has occasionally found, in small property, to become stopped.

The arrangement and design at the Jubilee Place sewer is the work of Mr. Harrington, of Ryde, who claims the idea as his own. On this point the author has nothing to say. He merely wishes the facts to be recorded for what they are worth.

APPARATUS FOR THE REMOVAL OF SLUDGE.

M. H. DESRUMEAUX, of Lille, has patented a device for removing the sludge formed in the chemical treatment of waste liquids by a continuous process of sedimentation. The illustration we reproduce from *Le Genie Civil* The apparatus is of cast-iron, cylindrical in form, and made up of a number of elements placed one upon the other. These elements are similar to each other with the exception of those which form the top and bottom of the column respectively. Each element consists of the interior of a spiral winding about an inside tube, and is divided by a partition along the diameter. The liquid to which the



requisite chemicals have been added passes down the tube at the left of the figure into the lower compartment D, and then passes in its spiral ascent to the upper compartment, which is provided with a filter. The sludge or precipitate is deposited partly in D, but the deposition goes on as the liquid rises and the mud flows through holes pierced at intervals in the central tube and falls into the compartment D. What little suspended matter still remains is removed by a filter in the upper compartment before the liquid is allowed to escape. E E are handholes for giving access to the interior, and r r are simply cocks by which the air is allowed to escape when the apparatus is put in operation.

AN English exchange says that a refuse-destructor is being built at Byker for the Corporation of Newcastle at a cost of about £7,000 (\$33,880). The site of the buildings is an old quarry at Byker. There are six burning-cells (Alliott, Fryer & Co.'s patent), a rubbish-destructor, 43 feet by 18 feet, and a long vaulted flue. The masonry around provides room for six other burning-cells which it is contemplated to erect in the future. The chimney is built of Normandy bricks, is 150 feet high, and is 44 feet 6 inches diameter at the foot, and 39 feet 3 inches at the top. From its position on a hilltop it will be a prominent feature in every view of the city and neighborhood. Tram-lines are laid both on the top and lower levels of the ground, in order to allow of the rubbish being brought to the destructor, and also to permit of the removal of the "clinker" left in the bars. A portion of this will be used for mortar-making, the remainder being shot into the old quarry, which will provide a receptacle for at least twenty or thirty years to come. The whole of the work, which is approaching completion, has been carried out from the designs of Mr. W. G. Laws, the City Engineer, and Mr. Littlefair is the Clerk of Works.

* Read by Mr. George Richardson Strachan, Assoc. M. Inst. C. E., before the Institution of Civil Engineers, and printed in the "Proceedings."

STEAM-FITTING AND STEAM-HEATING

BY "THERMUS."

No. LIII.

(Continued from page 21.)

COMBINED STEAM AND HOT-WATER APPARATUS.

In the last article an apparatus was shown that would work either as a steam or a hot-water apparatus, providing, of course, that the pipes were large enough to circulate the water rapidly enough to keep up a nearly equal degree of heat over the whole surface of the apparatus for the latter purpose—in other words, that the pipes were large enough for hot water. We may with safety assume that any apparatus whose pipes are sufficiently large to work well as a hot-water apparatus will work as a steam-apparatus, providing, also, that the pipes are properly run for steam. Therefore, in these interchangeable apparatus, it should be only necessary to establish the sizes of piping that will be proper for a hot-water apparatus. Before going, however, into the question of size of pipes, we will give two more illustrations of how apparatus may be made interchangeable.

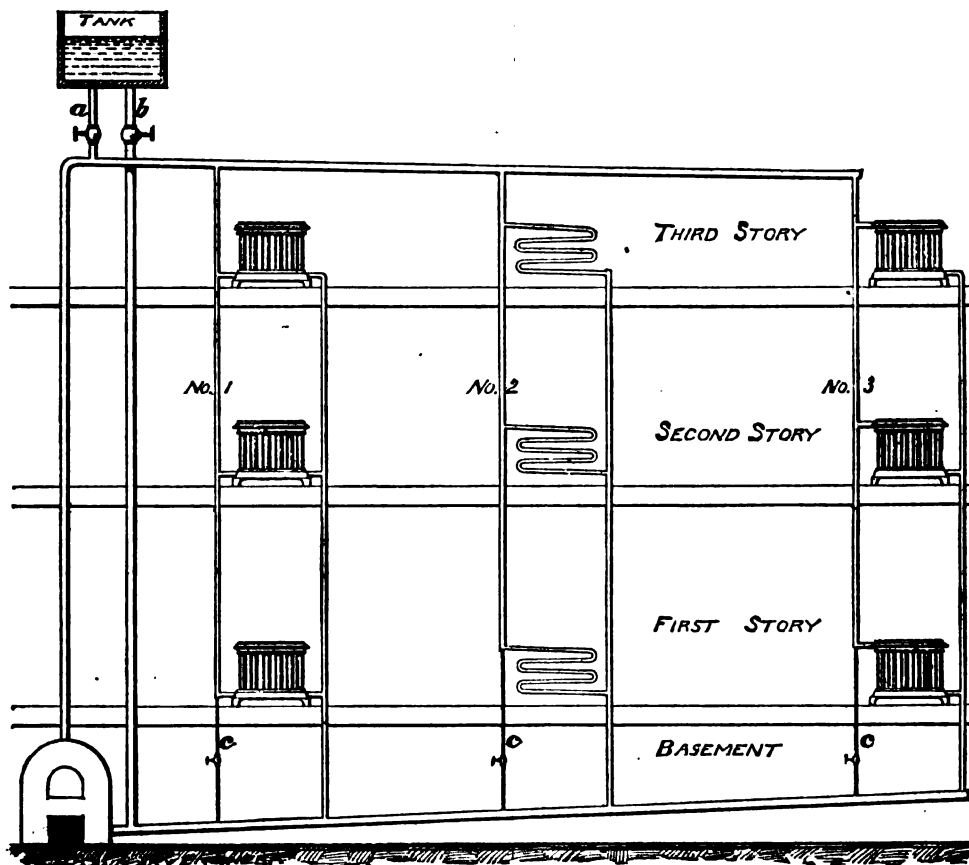


FIGURE 1.

Figure 1 shows one system of low-pressure steam-heating often used. Though it is called low-pressure, it will operate at any pressure, but when the term *low* is used by a steam-fitter, it is to be understood that the apparatus will work at low pressure, it being taken for granted that it will also work at higher pressures; whereas, when he says "*high* pressure," he means that it will work properly only at high pressures.

In this case the steam is taken to the top of the house and "fed" down. A steam-apparatus of this kind should usually be easy to change. In carrying the steam (or water) to the top of the house the air is easily liberated, a small pipe *a* running to the tank being the simplest way to accomplish this. From this point forward with this arrangement of pipes, then, air should not give trouble, and it is probable no air-vents would be required on any of the lines but No. 1. That line has radiators or coils fed at the bottom, and it would be well as a matter of precaution to put air-vents on the radiators or coils, as the case might be, at their highest point, for the purpose of being able to separate any air that should appear or that might be suspected to be present. With the line No. 2 this is not necessary, as no air-traps are made, and any air that might be separated from the water has ample chance to escape to the highest point of the apparatus. Nor will they be necessary with line No. 3, although it has radiators, as they are of the class which take supply on top.

With lines arranged in this manner, as shown, where the supply is downwards, each floor of heaters does about the same work. In other words, the heaters on the top floor will not have a quicker circulation than on the lower ones, for the reason that they are all part of the down leg of the same syphon, the perpendicular height from the main being the same when traced through any heater; whereas, when there are single, or, for that matter, separate risers to successive floors one above the other, with separate or even single returns, the heaters on the upper floors will circulate the faster, and consequently be the warmer, unless the riser flow-pipes are graduated in size, the upper ones being small in diameter compared with the lower ones, and the final regulation being obtained by the "choking down" of the valves. With the system shown here nearly all will flow alike with equal size of pipes and connections. The pipe *b* shows the expansion-tank connected with the return-pipe. This allows the pipe *a* to be closed entirely when the air is withdrawn, so that the apparatus may be run with a pressure and temperature somewhat higher than can be obtained with the tank on the flow-pipe and without vapor from the tank. The pipes *c c c* are the usual drip-pipes from the ends of the steam-lines. These pipes can have valves put into them so that they may be closed when

gauge-cock and glass safety-valve, regulating-doors and damper and feed-supply, most of which will require little or no special attention when the apparatus is full of water. The "try-cocks" and water-glass can remain undisturbed. The safety-valve, if it is tight, will require no attention. The pressure of the water under the rubbers of the regulating bowls may inflate them, at which time they may be weighted down or their chains disconnected, and the water-feeder may be "shut off" if there is any fear of the water from the apparatus getting back into the street water-mains, though the latter is not likely to follow if there is pressure enough to fill the apparatus without pumping it in.

A float and cock in the expansion-tank to keep the apparatus full of water may be dispensed with, as water can be admitted directly to the boiler by hand through the feeder, or through the "direct" water-connection to the boiler if one is used.

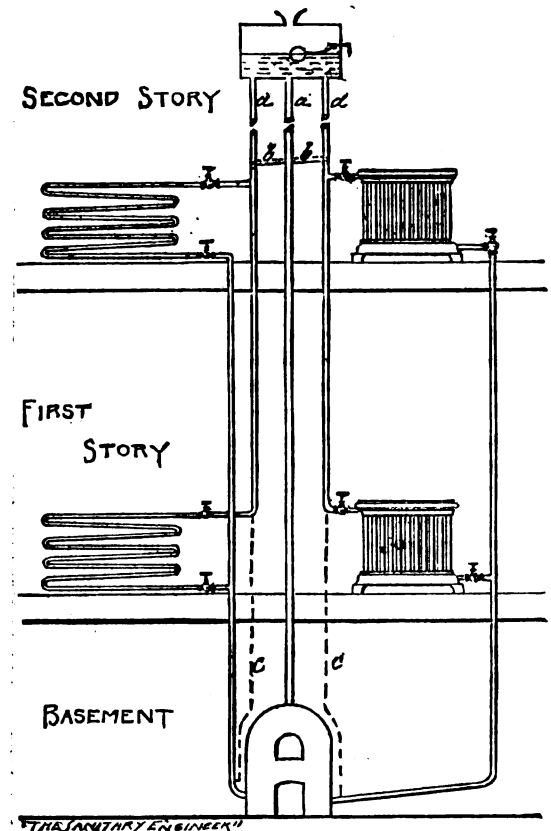


FIG. 2.

Figure 3 shows an apparatus such that, should the stand-pipe *a* from the valve upward and the tank be removed, it would then be a small steam-apparatus of good construction, and, with the addition of the pipe and tank, is a good hot-water apparatus. The only objection that can be

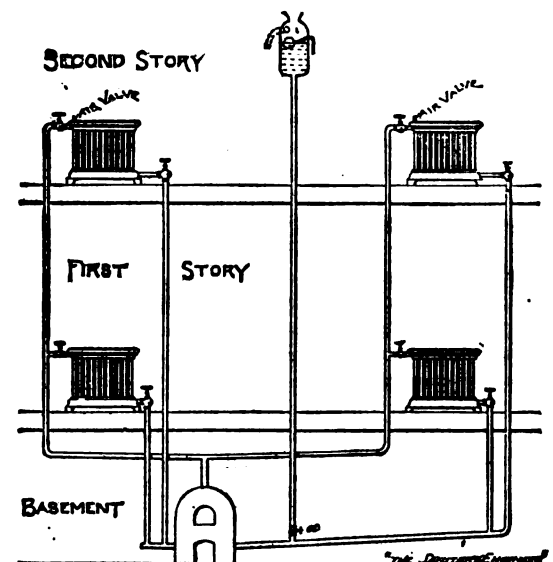


FIG. 3.

the apparatus is to be used for hot water, but it is very probable that, should they be neglected, they will make little or no difference with the working or circulation of the apparatus.

Figure 2 shows how a low-pressure hot-water apparatus of ordinary form may be changed to a steam-apparatus, provided all the time the joints and pipes are suitable.

The figure shows an ordinary apparatus in which the expansion-tank is on the head of the flow-pipe *a*. The pipes *d d* are the mains to the different ends of the house—say back and front of a city house. To convert this into a steam-apparatus, put valves in the pipes below the tank at *a* and *d d*, and put in additional connections *b b* between the pipe *a* and the two pipes *d d*. These latter pipes need not have valves, as the water circulation will go on just as well with them as without them, and when the three valves *a* and *d d* are closed they are then horizontal steam-mains in the top of the house. The pipes *c c* must be added as drips for the risers, and they may or may not have valves in them, as the whim or judgment of the person may dictate, as they are necessary for steam-apparatus, and they will not interfere with the working of a hot-water apparatus, especially if they are of small diameter— $\frac{3}{4}$ -inch, or $\frac{1}{2}$ -inch, or that which is usually used for steam-reliefs of small apparatus.

The boiler for an interchangeable apparatus should be fitted and mounted as fully as for a steam-apparatus, with

found to the last form will be that the circulation within the lower two heaters will not be as rapid as in the upper ones, but as long as it proves sufficient for the former the latter may be "choked" by their valves until the desired circulation is obtained.

We now come to the question of the size of flow-pipes for hot-water apparatus. Practical men disagree very much on this question. One will refer to a comparatively small pipe apparatus, that circulates very fairly, and say "it is useless to use large pipes," while another will use nothing much smaller than three or four inch pipes, even in the smallest apparatus. Within certain limits of size compared with the amount of heating-surface the pipe supplies this question of the diameter of the pipe regulates itself to a certain degree, though the fact is that when pipes are small in diameter a greater difference of temperature will exist between the *outflow*-pipe from the boiler and the *inflow* to the boiler, and between the *upflow* and the *downflow*, and, consequently, there is a greater difference of weight between the up leg of the syphon and the down leg and, consequently, more motive power. This is due in the small pipe apparatus to the fact that the bulk of water in pipes decreases in the same ratio as the square of their diameters, and that the surface to cool the water decreases directly or in the same proportion as the diameter. So that while a 1-inch pipe contains one-ninth the amount of water a 3-inch one does, it contains one-third of its surface, and all other things being considered the same, the water in the 1-inch pipe will lose just three times as many units of heat for a unit of its weight as it does in the 3-inch; and consequently three 1-inch pipes, though they contain but one-third as much water as a 3-inch pipe, present as much surface and would give off as many units of heat, if the water would circulate three times as fast, but as a matter of fact it does not, but will circulate in about the ratio of four for the large pipe to seven for the small one. This is because we are confronted with the fact that, theoretically, the water in the small pipe will *not* move just three times as fast as in the large one, though having three times the motive power, because the comparative velocities of water through pipes are as the square root of the power only. With such a very small pipe apparatus the *outflow* may have a temperature of fully 212° , or very near it—say 200° —and the inflow only 120° , or a difference of 80° , and which, in a high building—two or three stories—indirect radiation would give a comparatively high velocity through the pipes, and even in indirect work all within the basement, with, say, only a height of eight feet or less, will still give a pretty good circulation *as long as such a difference of temperature would last*. Practically the result of a high velocity is to lessen the difference of temperature between that at which the water leaves the boiler and that at which it returns, and anything that lessens the difference of temperature lessens the velocity, the result being a *mean* temperature and a *mean* velocity due to any particular apparatus and depending on several circumstances, the most prominent of which are size of flow-pipes, size of pipes in coils and their surface, and the difference of temperature between the surface of the coils and the air they warm.

If the friction in a pipe is not considered, the velocity of the flow of the water is proportional to the square root of the difference in height of the legs of the syphon. In other words, if a difference of ten degrees caused the water to flow at a velocity represented by 1, 20° would give a velocity of 1.41 and 90° a velocity of 3. If, therefore, we have two apparatus, one with three 1-inch pipes and one with a 3-inch pipe, the first having a difference of 90° and the other a difference of 10° , the same number of gallons of water will pass, *friction not considered*, in a given time, all other things being the same. This is why I say it regulates itself to a great degree (the surface being the same), and why there is so great a difference of opinion among practical men as to the actual size of pipes necessary.

In establishing the sizes of pipes, then, the first consideration is to fix the greatest difference of temperature desirable. This is necessary in an indirect apparatus, as we must know that its water will not only never be likely to be near enough to freezing point to endanger the coils, but that the coils will be always so much warmer than the air which passes over them as to be capable of warming it to the desired temperature before it enters the room. To fix the diameter of a coil of given surface for a given duty, or to find the duty of a given diametered coil of a stated length, in usual coil form, therefore comes first. Hood has found that air passing over a pipe in a room with the air moving by natural currents produced by the warm pipe such as takes place by direct radiation, extracts heat from the pipe to the amount of 1.71 heat units per hour per square foot of pipe-surface for each degree the air of the room is colder than the surface of the pipe. This is pretty well substantiated by experiment on the loss of heat per square foot of surface of steam-radiators by experiments by well-

known steam-engineers, in which the units of heat per square foot of average surface in vertical radiators ranges between 1.72 and 2.25 heat units for steam at from five to ten pounds pressure and air of rooms at between 60° and 70° Fah. The greater condensation or loss of heat rather due to the steam is easily accounted for when we know that condensation will go on within a steam-pipe nearly in the same ratio as the air can come in contact with it, while with a hot-water pipe the cooling depends somewhat on the rapidity with which the particles of water roll over, come in contact with the iron inside, as well as the ability of the cool air to extract heat from the warm surface of the iron. If we, therefore, consider *two* units of heat given off from every square foot of direct coil for each degree difference of temperature between the mean temperature of the water in the coil and the temperature of the air of the room at the floor-line, we will be establishing a safe factor for our purpose of estimating the loss of heat from the water in direct hot-water coils.

When estimating the loss of heat from indirect hot-water coils the same method might be followed, presumably, if the air moved only at the velocity due to its rarefaction in the coil; but as the air under such conditions is controlled more by the height of the flues and the temperature maintained (as it may be forced by a fan), presumably, it is better to find the heat added to the given quantity of air passed in a given time and assume the coil to lose an equal quantity of heat in the same time.

(TO BE CONTINUED.)

ROCHESTER'S NEW PLUMBING LAW.

THE following is the text of a plumbing law enacted by the Legislature of New York, at its recent annual session, for the city of Rochester:

AN ACT to secure the registration of plumbers and the supervision of plumbing and draining in the city of Rochester.

The People of the State of New York, represented in Senate and Assembly, do enact as follows:

SECTION 1. On or before the first day of June, eighteen hundred and eighty-six, every plumber carrying on his trade in the city of Rochester shall, under such rules and regulations as the board of health of the said city of Rochester shall prescribe, register his name and address with the clerk of the board of health of said city, and after said date it shall not be lawful for any person to carry on the trade of plumber in said city unless his name is registered as above provided.

SEC. 2. A list of the registered plumbers in the city of Rochester shall be published in the newspaper designated by the common council to publish the official proceedings of the boards and departments of the city of Rochester at least once in each year.

SEC. 3. The drainage and plumbing of all buildings, both public and private, erected in the city of Rochester, after the first day of June, eighteen hundred and eighty-six, shall be executed in accordance with plans previously approved, in writing, by the board of health of said city. Suitable drawings and descriptions of said plumbing and drainage shall, in each case, be submitted to the board of health of said city, and shall, by said board, be placed on file in its office; said board of health is also authorized to receive and place on file drawings and descriptions of the plumbing and drainage of buildings erected prior to the passage of this act in said city.

SEC. 4. The Supreme Court of the State of New York, and county court of the county of Monroe, or any judge or justice thereof, shall have power at any time after the service of notice of violation of any of the provisions of this act, and upon affidavit of one of the members of the board of health of said city, to restrain by injunction order, the further progress of any violation named in this act, or any work upon or about the building or premises upon which or with reference to which said violation exists. Any civil action which may be brought under the provisions of this act shall be brought in the name of the city of Rochester as plaintiff, and it shall be the duty of the city attorney of the city to commence and prosecute any such civil action upon being directed so to do by resolution of the board of health of said city.

SEC. 5. The board of health of the city of Rochester shall have power to adopt such rules and regulations for the registration of plumbers and drainage in the city of Rochester as such board shall deem proper, but said board shall not prohibit the use of any material for drainage which is considered suitable and proper for such purposes.

SEC. 6. Any person violating any of the provisions of this act shall be deemed guilty of a misdemeanor.

SEC. 7. This act shall take effect immediately.

[Rochester is to be congratulated on the success which has attended the efforts of her board of health to secure the passage of a law authorizing the registration of plumbers and the inspection of plumbing-work in her limits.

We fear that the authorities will find that Section 5 will make trouble for them. It is certain that those interested

in the sale or use of any materials or appliances which the board of health may for good reasons object to, will maintain that the board cannot prohibit their use, because of this section, which forbids the board to "prohibit the use of any material for drainage which is considered suitable and proper for such purposes," but does not provide who shall decide what is proper. Clearly this matter should be left to the sanitary authorities and their competent professional advisers. To make it, as here, an open question will put a considerable obstacle in the way of efficient enforcement of the regulations which the board may make under the law.]

Correspondence.

PLACING AN ORDINARY KITCHEN-BOILER IN A HORIZONTAL POSITION.

PHILADELPHIA, July 31, 1886.

SIR: This is our mode of setting a horizontal circulating boiler (Fig. 1). It works without a fault, cannot be improved, and saves cost and an unsightly quantity of pipes.

J. REYNOLDS & SONS.

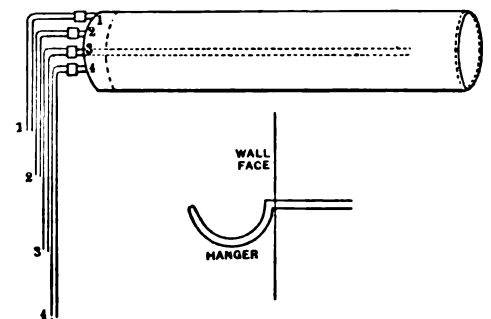


FIG. 1.

1. Hot-water pipe from boiler.
2. Pipe from water-back.
3. Cold supply-pipe to boiler.
4. Pipe to water-back.

[There is no doubt the arrangement shown by our correspondent will circulate. Still, we are of the opinion the results would be slightly improved if pipe No. 1 were taken from a spud on the extreme top of the boiler, and pipe No. 4 were taken from a spud on the extreme lower side of the boiler. On the one hand, there is no cold water left remaining at the under side of the shell, and, on

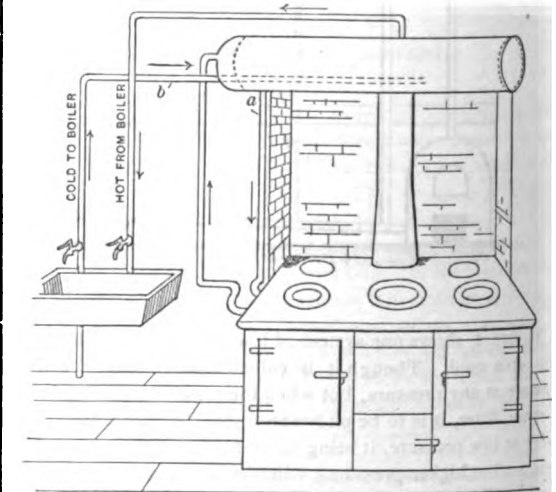


FIG. 2.

the other, the very hottest water is drawn from the top of the shell. Nor can air be imprisoned there.

This is our advice to "Plumber," issue of July 29, which you will notice if you will take his diagram and make the alterations in it as we suggest by the dotted lines, removing his unnecessary lines.

To make this quite clear, we give again the cut of July 29 (Fig. 2) arranged as we would have it.]

HOT-WATER HEATING-STOVE.

BURLINGTON, VT., July 28, 1886.

SIR: Will you please give us the address of the firm that makes the hot-water heating stove, Fig. 90, in the "Plumbing and House-Drainage Problems," and oblige,

JOHN GRIFFIN & SON.

[The apparatus was exhibited at the International Health Exhibition in 1884, in London, England, by A. B. Peck, of Osterbrograde, Copenhagen, Denmark, by addressing whom the information you seek will, presumably, be obtained.

HOT-WATER RADIATORS COMPARED WITH STEAM-RADIATORS.

37 UNIVERSITY PLACE
MONTREAL, July 24, 1886. }

SIR: (1) Will you kindly inform a reader of your valuable paper what is the difference of heat in steam and in hot water? In other words, how much a steam-radiator—say twenty feet of 1-inch pipe—is more efficient as a heater than an equal number of feet are in a hot-water radiator.

(2) Also, how many feet of 1-inch pipe is required to heat 100 cubic feet of space in ordinary rooms, to (say) 70° Fah., when the outside temperature is 12° Fah. below zero?

(3) Will you also tell me if I am correct in finding the cubic space in a room when I proceed by multiplying the width by the length of a room and then by the height, say $20' \times 16' \times 9' = 2,880$ cubic feet?

(4) Will you also give me common or rule-of-thumb way of adding or taking interests or discounts from seventy-five per cent. off to five per cent. off price-lists, or to put them on, if required? Yours truly,

"YOUNG PLUMBER."

[(1) It requires about one-half more pipe surface for hot-water service than it does for low-pressure steam.

(2) From four to seven feet lineal of 1-inch pipe in the form of a direct steam-radiator to each 100 cubic feet of space is, usual, varying with conditions and pressure of steam.

(3) Your method of finding the cubic contents of a room or building is correct.

(4) The ordinary way to compute interest is to multiply the amount at issue by the premium and divide by 100—thus, say six per cent. interest on seventy-five dollars.

We have $\frac{75 \times 6 \text{ per cent.}}{100} = 4.5$, or four and one-half

dollars as the amount of interest at six per cent. that seventy-five dollars will bring for one year.

The plumber sometimes, in finding the net cost of his goods, works by what you might call a "rule of thumb" if you please. Suppose, for instance, the discount is forty per cent. off, he, instead of multiplying by 40 and dividing by 100, and then subtracting the remainder from the gross price, multiplies by 60 (the difference between 40 and 100) and divides by 100, and has the remainder as the net price of his goods.]

QUESTIONS ABOUT HEATING AN OFFICE BUILDING BY STEAM.

BURLINGTON, VT., July 23, 1886.

SIR: I desire to get a little information from your fountain which flows so freely and so wisely to all corners. I wish to heat a building by indirect steam radiation. The boiler I wish to use is in the basement, and is used for driving our machinery through a 15-horse engine, perhaps not averaging to use over half the capacity of the engine. The boiler is a 25-horse, and is brick-covered, carries sixty pounds of steam, and is in operation constantly night and day, except Sundays. The basement and second and third stories are about 22x56 feet, the third and fourth stories are about 22x40 feet, and all the ceilings are about nine feet high. The basement is, of course, heated a good deal by the boiler. The first story, with a single floor between it and the basement, also gets a good deal of heat from the basement. The building is of brick, and is in a block, with its ends having a north and south exposure. There are four windows in each end of each floor with about fifteen square feet of glass.

What I would like to know is the best plan of heating. I want indirect radiation, with the pipes in the basement, if I can. I would like to know how it is best to place the pipes? Whether it is best to use a blower? Whether several separate coils of pipe, or only one large one from which all the warm-air pipes would radiate? Whether we could use our exhaust? Whether it is best to have more than one register on each floor, all the floors being in a single room except the third, which has three to heat; and last, how many feet of inch pipe it would require to do the service?

JOSEPH AULD.

[Unless your engine is run all the time that it is necessary to warm the building it is better to provide an apparatus that will operate without a fan. To this end, for indirect radiation, you should have a separate coil or heater for each air-flue or register. Of course, when air is taken into a building for the purpose of warming, provision has to be made for letting out a corresponding bulk of air through suitably arranged outlets or vent-pipes. To warm and ventilate, then, requires a systematic arrangement of flues, and to do the latter properly by natural currents requires flues of considerable magnitude. With indirect radiation for warming alone, air-currents with high temperatures, small volumes and comparatively small flues will do; but to properly warm and properly ventilate at the same time,

for any considerable number of persons, at least 1,000 cubic feet of air per hour per person must be admitted, and at a temperature sufficiently low to prevent overheating.

As to the best plan for heating your building, we must frankly confess we don't know, without more knowledge of your building; as what is sometimes best in one place would not be suitable in all other places, and the question of what is best in the building you describe is a matter of doubt with us for many reasons. Of course, speaking from the hygienic standpoint, one to two thousand cubic feet of air per hour per individual, admitted at a temperature of 68° or 70° Fah., would be so good that no one who has made a study of the question could find fault, unless your building was used for a hospital or chemical laboratory, or some such place where more than the breath of individuals were present to cause vitiation. But the practical questions in your case may be:

(1) Can you litter the ceiling of the basement with coils and air-pipes, and have you suitable places in the walls of the basement at which you can take air in, without interference with the light, or is your ceiling so arranged and occupied with shafting, hangers, and pulleys that the paraphernalia of coils and flues and mixing-dampers for a good apparatus cannot find space; as the ends of the basement will be required for this system—i. e., indirect, with natural currents?

(2) Can you run flues of galvanized iron or other suitable materials of about one square foot of cross-section, starting with two for each floor, one front and one back, dropping them at their respective floors as you go up in the building?

(3) Can you run vent-flues of equal size and number to and through the roof, commencing them on the floors as you drop the hot-air flues, only at an opposite position?

(4) Can you do the two last-mentioned without disturbing present space too much?

For forced heating and ventilation by the use of a fan smaller flues will do, and one large stack of coils may be made to do, but still space must be taken in the basement for air-inlet, coil-chamber, and fan, with suitable air-mixing dampers. It is just possible, in a building of the dimensions you give, that all the air might be taken by natural currents from one large coil and be made to give very good results. In other words, a fan may be omitted, if ducts can be made of such magnitude that with a velocity of two to three feet per second all the air required will pass.

The exhaust steam from the engine can be used with any system of piping, if the pipes are run somewhat large in diameter and a low pressure carried in them, against which the engine must exhaust. If such an arrangement is used care must be taken that no oil is carried from the cylinder of the engine into the boiler through the steam-pipes and condensed water. There is no question but your boiler is ample to warm the building by any ordinary method for ordinary purposes. If you warm by any form of indirect radiation you will require about 2,000 feet lineal of 1-inch pipe in coils, provided you carry a pressure of steam sufficiently low to use the exhaust from engine. If you carry boiler pressure in your coils you will require between 1,200 and 1,300 feet lineal. You will, with a properly arranged apparatus, find it cheaper for fuel to use the exhaust steam, and the greater quantity of pipe, as presumably the exhaust-steam alone will be sufficient for your purpose, making it practically cost you nothing for fuel for warming, except the interest on the extra cost of plant.]

COMPUTATIONS RELATING TO HEATING-SURFACES.

NORMAL PARK, ILL., July 21, 1886.

SIR: Will you please explain in an early issue of your journal the working out of the following rules in Schuman's "Heating and Ventilation"? On page 40 we find the following rules and examples:

$$\text{Radiation } L_1 = 225r(1.0043^{t-32} - 1.0043^{t_1-32})$$

$$\text{Contact of air } L_2 = 0.09824y(t - T)^{1.25}$$

Examples:

$$t = 210^\circ; t_1 = T = 70^\circ; r = 0.648 \text{ and } y = 3.$$

$$L_1 = 225 \times 0.648 (2.135 - 1.175) = 139.96.$$

$$L_2 = 0.09824 \times 3 \times 442.77 = 130.49.$$

What I want to learn is the detailed method of obtaining the figures underlined by the rules given above.

Yours truly,

C. E. R.

[As we understand our correspondent, he wishes to know the mathematical operations by which the underscored fig-

ures are obtained. In other words, how can we obtain the $(t-32)$ power of 1.0043, or the $1.188\frac{1}{2}$ power of $(t-T)$. This can be done most expeditiously by a table of logarithms.

Taking the first equation: $t-32$ in the example is equal to 178, $t_1-32 = 38$ and $t-T = 140$.

$$\text{Logarithm of } 1.0043 = 0.0018635.$$

$$0.0018635 \text{ multiplied by } 178 = 0.3317035.$$

Natural number of 0.3317035 = 2.1464 (the number sought) Again,

$$0.0018635 \text{ multiplied by } 38 = 0.0708130.$$

$$\text{Natural number of } 0.0708130 = 1.1771$$

$$\text{Logarithm of } 140 = 2.1461280.$$

$$2.1461280 \times 1.233 = 2.6461758$$

$$\text{Natural number of } 2.6461758 = 442.77$$

The decimals differ slightly from those given by our correspondent on account of the logarithms being extended to seven figures.]

Novelties.

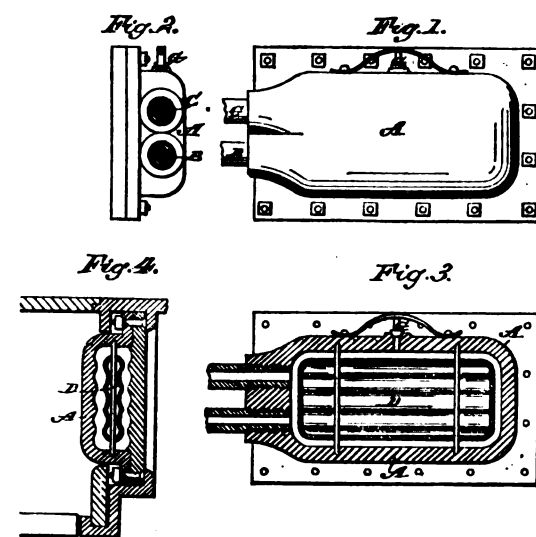
Under this heading we propose to describe and illustrate appliances of probable interest to our several classes of readers. The selection will be made without reference to the wishes of agents or patentees, being governed solely by considerations of novelty, ingenuity, and probable interest to readers, and especially the fact that they have not been elsewhere described. As a rule we shall make no comments, and it is to be distinctly understood that a notice does not imply approval. No charge will be made for these notices, and any offer of pay for their insertion will insure their omission. We shall be glad to have our attention called to novelties suitable for this section.

WATER-BACK.

THE accompanying illustrations show a novel water-back for stoves and ranges recently patented by Henry Engelbert, of Detroit, Mich., the object being to provide a back for domestic boilers that will not burst either by frost or by steam or water pressure.

Figure 1 is a side view of the water-back, Fig. 2 an end view, Fig. 3 a longitudinal section, and Fig. 4 a cross-section of the water-back in a range.

The water-back A is made of any suitable metal, and consists of two pieces bolted together and forming a compartment between them, and the pipes B and C are the ordinary circulation-pipes between the boiler and the water-back. Within the water-back is placed a compressible



hollow vessel, D, made of sheet-metal and closed, the sides of which are corrugated, as are also the inner sides of the water-back, the vessel D being held in place by pins projecting from the same and fastened in the top and bottom of the water-back. The water-back is held in the furnace, range, or stove about as shown in Fig. 4.

The intention is that should the water in the back A by any means become frozen the pressure from the expansion instead of being exerted on the outer shell of the back will compress the inner chamber D, which offers less resistance and which is made corrugated and spring-like for this purpose. A safety-valve, G, is provided to obviate over-pressure from steam should the connections also be frozen or to relieve the steam or expansion of water that will follow the starting of a fire before the connections are thawed.

Gas and Electricity.

Illuminating Power of Gas in New York City.

Week ending	New York Gas-Light Company.	Manhattan Gas-Light Company.	Metropolitan Gas-Light Company.	Mutual Gas-Light Company.	Municipal Gas-Light Company.	Kickerbocker Gas-Light Company.	Equitable Gas-Light Company.
August 7.....	25.32	21.31	20.64	30.61	27.94	20.62	29.12

E. G. LOVE, Ph.D., *Gas Examiner.*

PROTECTION FROM LIGHTNING.

In a recent report to the commissioners for the erection of the public buildings in Philadelphia, Professor George F. Barker makes the following recommendations: The main tower is to have a height of 537 feet 4½ inches above the pavement. He advises that this be protected during erection by at least two conductors, to pass respectively through small shafts in the south-east and south-west corners of the tower, and to be so secured as to permit of easy adjustment as the height of the tower is increased. The conductors to be attached metallically at frequent intervals to the iron frame-work of the main building. By preference, the conductors should be made of copper-wire rope not less than one inch diameter, the wire to be of rather large size, certainly not smaller than No. 7 or 8 of Brown & Sharp's gauge.

The conductors should terminate below with as perfect a ground-connection as it is possible to attain; and a well within the walls of the tower (now existing), the bottom of which is below the permanent water-level in the soil, is recommended—the excess of wire rope being coiled up within the well. This excess should not be less than thirty feet in length of each conductor.

At the upper ends the conductors should be firmly connected with the circular iron track on which the steam-derrick revolves. From the iron frame-work of the derrick-trucks short lengths of copper-wire rope should be carried to the most prominent parts of the derrick, particularly to the corners of the upright central brace, to the boiler-stack, the roof of the engine-house, etc. Each of these should extend two feet or more beyond the point to be protected, and the rope should be untwisted so as to present a brush of separate wires.

For the protection of the building itself, he recommends that the flag-staffs be made to terminate above in a number of sharp points so as to prevent an explosive discharge. These points to be made of nickel to insure good conductive power, and be able to resist atmospheric influences. Allowing the rule that a rod protects a circular area whose radius is equal to its height above said area, the whole building will by these means be perfectly protected.

The permanent system of protection after the building is completed, he thinks, should be based on a thorough experimental investigation of its electrical condition, and this should precede the adoption of any final system.

It is rumored that a great gas consolidation project is to be carried out in Jersey City.

THE Standard Gas-Light Company of this city is acquiring property on the river fronts for the erection of large works. The company will operate in connection with the New York Steam Company.

A LECTURE on "Petroleum and Its Products," by Mr. Boverton Redwood, before the Society of Arts, and printed in the society's *Journal*, contains a table showing the yearly production of crude petroleum in the United States since 1859. The figures for that year are 5,000 barrels, although authorities differ somewhat as to the quantity. In 1860 the production was 500,000 barrels; in 1870, 5,673,195 barrels; in 1880, 26,562,000 barrels. The maximum production was reached in 1882 with 31,051,165 barrels, since which time it has yearly decreased to 21,600,651 barrels in 1885.

M. MUCHALL, of Berlin, has devised a little appliance for detecting a leakage of gas from house-service pipes. It consists of a small pipe bent twice at right angles and connected with the service before and after the main cock. A small glass bulb, partly filled with a mixture of glycerine and water, is placed on this pipe. A tube dips into the liquid in the bulb, and is so arranged that any gas passing through the small pipe bubbles through the liquid. The

bulb is also provided with cocks at its inlet and outlet. If these latter are opened and the main cock closed and the burners shut off, any bubbles in the liquid show a leakage of gas in the pipes or fixtures beyond.

ACCORDING to the *Record*, of Philadelphia, that city has 352 electric-lights, which, on the average, cost fifty-five cents per lamp per night. This, it is claimed, is a cheaper rate than that obtained by any other large city in the country. It is certainly cheaper than the lights in this city, which cost seventy cents per night. Many of the companies give low figures in consideration of the privilege of placing their wires upon the city poles, and still the Chief of the Electrical Department says that most of the companies which do lighting for the city lose money by it. There are some five or more companies supplying electric-lights to the city. The price varies from 39¼ cents to sixty-two cents per lamp.

Reviews of Books and Pamphlets.

INDUSTRIES. A journal of engineering, electricity, and chemistry for the mechanical and manufacturing trades. 22 Wellington Street, Strand, London.

This is a new supplicant for popular favor, No. 2 being now before us. Time alone will show whether it will fill a place not now occupied by other journals. This issue contains a number of interesting articles, trade reports, news items, etc. The most valuable item to a practical man is the graphical diagram for determining the pitch and diameter of rivets required for various thicknesses and methods of riveting.

FIRST ANNUAL REPORT OF THE BOARD OF HEALTH OF THE CITY OF NEWARK, N. J., for the year 1885. 47 pp., 8vo.

This report, prepared by the Health Officer, Dr. David L. Wallace, contains a brief but interesting account of the city from a sanitary point of view, a preliminary account of stock as it were, from which we take the following notes.

The population of Newark, according to the census just completed by the State Department, is 152,988, of which 3,265 are colored, 23,185 foreign-born Germans, and 12,917 foreign-born Irish. The total area of the city is 11,463 acres, the eastern and southern portions being level and from ten to thirty feet above tidewater, the northern and western portions being from 120 to 230 feet above tide. The general water-supply is taken from the Passaic River, above Belleville. This river receives the sewage of the city of Paterson, situated sixteen miles above the Newark intake, and besides this there are seven sewers opening into the river in Newark itself. With each tide part of the drainage discharged through these is carried to and above the intake of the water-supply. Dr. Wallace estimates that two-thirds of the pollution found in the water is due to the sewage of Newark and points below the intake, and one-third to the city of Paterson and points above the intake. There are a large number of wells in use throughout the city, and some of them are dangerously close to cess-pools and privy-vaults. An ordinance has been introduced for the closure of polluted wells.

The city has forty-five miles of brick sewers and nine miles of pipe-sewers, and at present is engaged in carrying out a portion of a plan for a series of intercepting-sewers leading to a pumping-station, from which the sewage is to be pumped to Newark Bay. If this be completed the whole sewage will be diverted from the Passaic, and nothing but storm-water will pass into the river.

Newark has 132 miles of graded streets, of which forty-six miles are paved—26½ miles are paved with cobblestones, 12½ miles with Telford paving, and 7½ miles with granite and trap-rock blocks. According to the census of 1885 there were 19,466 dwelling-houses occupied by 34,499 families. A systematic house-to-house inspection has been commenced, and a large number of nuisances and cases of defective plumbing have been discovered and rectified. There are a large number of privy-vaults and cesspools in the city, a majority of which are leaky and improperly constructed. Their contents as they fill up are removed by the odorless excavating process and carted to four farms in the vicinity. There are thirty-eight school-buildings, containing an aggregate of 346 class-rooms. Of these twenty-five are heated by steam, five by hot water, and eight by stoves. The ventilation is, as a rule, not satisfactory. Some of the new buildings are connected with the sewers, but the majority depend on the old-fashioned privy-vaults.

The new Board of Health has been organized under the provisions of a recent act of the Legislature, but from a recent decision of the Supreme Court it would seem that this organization was not in proper form, and that additional legislation will be necessary to put it upon a proper basis. The annual death-rate for the year was 23.93 per 1,000, which must be considered a high rate for a city of this size. Of the 3,660 deaths registered 222 were from diphtheria, 67 from typhoid fever, 510 from consumption, and 237 from pneumonia. The impression that we get from this report is sanitary work has commenced in earnest in the city, and that it is high time that such should be the case.

A BRIEF REVIEW OF THE OPERATIONS OF THE HOME DEPARTMENT (JAPAN) in connection with the cholera epidemic of the 18th year of Meiji (1885). 66 pp., 8vo. With tables and charts.

In the introduction to this report the Director of the Sanitary Bureau, Nagayo Sensai, remarks that while Japan has suffered from cholera during the year, there are "no popular tumults to record, no mobbing or injury of health officers or physicians engaged in their work of mercy, no organized attempts to hamper and arrest the execution of the various measures enforced for the public benefit, even when most onerous or even apparently arbitrary and severe. On the contrary, we are glad to acknowledge the hearty and intelligent assistance received, not only from the officers of the different departments of the Government, both local and general, but from private organizations and individuals as well, while the people at large have readily acquiesced in the work of sanitation, occasionally rendering substantial aid to the authorities."

The total number of cases reported from the commencement of the outbreak at Nagasaki, August 23, to the end of November, was 11,927, and the number of deaths was 7,152, or about sixty per cent. The disease was, therefore, of unusually fatal type. The epidemic was almost entirely confined to the southern portions of the country, and it seems probable that the active sanitary work carried out had much to do with limiting its spread.

The report is one that is highly creditable to the department.

REPORT OF THE HEALTH OFFICER OF THE DISTRICT OF COLUMBIA, for the year ending June 30, 1885. 158 pp., 8vo. Washington: Government Printing Office. 1886.

Dr. Smith Townshend, the Health Officer, commences his report with the remark that, while the statistics indicate a slightly increased mortality as compared with that of the previous year, this increase has occurred in the deaths from what are usually known as the non-preventable diseases. The death-rate for the whites is given as 19.97, and for the colored as 34.45 per 1,000, which is about the usual difference in the mortality of the two races. These figures are based on an estimated population of 130,700 whites and 69,300 colored, or 200,000 in all. The usual elaborate tables of deaths, which make this report one of the most valuable of the kind to the vital statistician, are given, with two maps of the city showing the localities in which deaths from certain diseases occurred. These maps have now been published for a series of years and should be carefully examined by those who intend to become residents of the District.

The special feature of this report is the account given of the results of a systematic sanitary inspection of eleven of the principal populated suburbs of Washington, with maps illustrating the relative position of wells and privies, and embodying some very interesting facts relating to the geology of the district furnished by Mr. W. J. McGee, of the U. S. Geological Survey. The general feature of the geological formation of Washington and its vicinity which is of most interest in a sanitary point of view is that the upper layers of clay and loam rest on sand and boulders, which in turn rests on rocks belonging to the gneiss formation. The result of the disposition of the various strata is that subsoil water circulates slowly through the upper layers, but freely through the lower portions, and the movement of the water is much more free horizontally than it is in a vertical direction, the general movement of the flow being to the east.

In the eleven suburbs inspected there were 916 houses and 257 wells. There were 749 privies, of which 22 were either leaking or without a proper receptacle, and 44 were reported as being "unlawful," though in what way is not specified. The water in four wells was found to be unfit for use. This part of the report should be interesting reading for the residents of these localities.

The report of the inspector of plumbing shows that 1,700 plans for plumbing in new houses have been approved during the year. With the present prospects of the eight-hour movement among the building trades of the city it seems probable that the number approved this year will be less.

The report is a good one, and shows that the Health Department is doing excellent work.

INTERNATIONAL MEDICAL CONGRESS.

THE ninth congress, it is now decided, shall meet in Washington on September 7, 1887.

AUTHORS who desire to furnish papers to the Fourteenth Section of the Medical Congress ("Relation of Disease Germs to the Origin and Spread of Contagious and Infectious Diseases and to Endemic and Epidemic Diseases") should notify Dr. Joseph Jones, P. O. Box 1,500, New Orleans, La., as soon as possible.

THE Secretary of the American Institute of Architects has sent to all the chapters of the institute a request that they shall appoint committees to act with the Boston committee, as it is desired that the memorial shall be a national rather than a local tribute. The Boston committee consists of Messrs. E. C. Cabot, Robert S. Peabody, Arthur Rotch, Robert I. Andrews, and Edmund W. Wheelwright.

Association News.

NATIONAL ASSOCIATION OF WATER-WORKS CONTRACTORS.—The semi-annual convention will be held at Saratoga, N. Y., on August 26 and 27. Those intending to be present can obtain programmes, etc., from the President, John T. Langford, 70 Kilby Street, Boston, or from the Secretary, C. H. Eglee, Flushing, N. Y.

ARCHITECTURAL LEAGUE OF NEW YORK.—Members of the league, on invitation of General Stone, went to Bedloe's Island Tuesday afternoon to examine the work on the erection the Bartholdi Statue of Liberty.

THE CHICAGO MASTER PLUMBERS' ASSOCIATION met August 4, President T. C. Boyd and Secretary Joseph Alcock occupying the platform. State Vice-President S. J. McGraw reported considerable work done, and asked for the per capita tax due. His report was ordered forwarded to the National Association. Andrew Young asked to be released from committee work, and the request was granted. Mr. Genung, of the City Health Office, was asked to attend at the next meeting and explain the city's policy regarding metal joints.

DETROIT, MICH., MASTER PLUMBERS.—The officers of the Master Plumbers' Association recently organized are: James Lane, President; James Meathe, Vice-President; John Cameron, Treasurer; Thomas P. Tuite, Secretary.

PERSONAL.

SURGEON-GENERAL ROBERT MURRAY has been placed on the retired list of the army.

MR. JOHN W. CLOUD has been appointed mechanical engineer of the Pennsylvania Railroad.

MR. I. N. DEVARONA, of Brooklyn, has been appointed Engineer-in-Charge of the construction of the driven-well system of water-supply for Albany, N. Y.

Notes.

For works for which proposals are requested, see also the "Proposal Column," pages 245 and 246

CONSTRUCTION.

SCHOOL-HOUSE COMPETITION.—The time during which competitive plans will be received by the Mayor of Hoboken, N. J., for a new school building has been extended from August 17 to August 31.

MARBLEHEAD, MASS.—On August 6 town meeting accepted the act authorizing the supplying of the town with water; \$250 was appropriated for making a preliminary survey. At the same meeting \$15,750 was appropriated for the extension of Atlantic Avenue. W. H. Coates was moderator.

BRAINTREE, MASS.—On August 3 a town meeting, John Cavanagh, Moderator, was held to act on a proposition for buying the works and franchise of the Braintree Water-Supply Company. Action was deferred to a meeting to be held September 7. Meantime the town has a committee investigating sources of water-supply, and its report will be presented at the same meeting.

TORONTO, CAN.—The report on sewerage by Hon. W. J. MacAlpine, of New York, Kivas Tully, C. E., of Toronto, and City Engineer Sproatt, has been presented to the council. The experts do not approve of Mr. Sproatt's plan for pumping the sewage to a higher level and emptying it six miles east of the city. The report proposes a trunk sewer to work under a hydraulic grade to empty in thirty feet of water two miles from shore and three miles east of the water-works intake crib. The cost is estimated at \$1,115,000. City Engineer Sproatt signs a minority report suggesting that the outfall be placed one mile further east or four from the intake crib at extra cost of \$100,000.

ISHPENNING, MICH.—A \$25,000 school-house will soon be erected, and \$15,000 will be expended in extending the water service.

GREEN BAY, WIS.—A stock company has been formed to build water-works here.

GRAFTON, DAK.—The City Council has decided to put in water-works immediately.

ALBANY, N. Y.—It is proposed to build a new reservoir on Signal Hill, pumping water to it from the driven wells on Rensselaer Flats.

APPLETON, WIS.—Captain N. M. Edwards, Dr. Winslow, and Mr. H. D. Smith have been appointed a committee to investigate the water-supply question.

ALTOONA, PA.—A correspondent of *Altoona Tribune*, in the issue of August 7, says that a report will be received from the engineer in a few days on the question of largely increasing the water-supply.

DEL NORTE, CAL.—The Town Trustees have appointed Messrs. Heywood, Foote and McLeod a committee to obtain estimates on the cost of constructing water-works. The general opinion is that works should be constructed if it can be done at a cost of \$25,000.

BOSTON, MASS.—A commission, consisting of James B. Francis, Eliot C. Clarke, and Clemens Herschel, which was appointed last February to consider the flooding of Roxbury and the Back Bay district by the overcharging of the Stony Brook conduits during heavy rains, has submitted its report. Briefly it is recommended to build at once a new channel 4,542 feet long, having a capacity for discharging 2,000 cubic feet of water per second from above the Tremont Street crossing of the Boston and Providence Railroad to Back Bay Pond; estimated cost \$593,880. Further works to be carried on later are an extension of the conduit upward to the junction of Bussey Park Brook, 13,650 feet, cost, excluding land damages, \$1,319,581; also, in the distant future, the construction of conduit, chiefly in tunnel, from the junction of the main stream and the Franklin Park branch to Neponset River, at an estimated cost of \$1,000,000. The Mayor, in transmitting the report to the City Council, August 2, urges speedy action on the first recommendation. The Aldermen have referred the report to a special committee—Donovan, Coe, and Barr.

BOSTON, MASS.—Two plans for extensive improvements in the Back Bay are now under discussion. One favored by Charles Francis Adams, T. E. Kidder, and others, proposes the extension of Brighton Avenue and the construction of a park and boulevard. This project is embodied in a petition which the Aldermen have referred to the Joint Committee on Streets. The other project, backed by H. M. Whitney, J. Montgomery Sears, and others, proposes the continuation of Commonwealth Avenue to Chestnut Hill Reservoir, and the building of a cable road. A petition for these objects will be presented to city councils.

MONTREAL, CAN.—Mr. Percival W. St. George, City Surveyor, has presented a report to the Road Committee of City Council on the cost of building a proposed intercepting-sewer in St. Jean Baptiste Ward, fixing it at \$114,526.17, plus 20 per cent. for contingencies. The report has been favorably received by the committee.

ELGIN, ILL.—While the water-supply question is under consideration Messrs. Moffett, Hodgkins & Clark, of Watertown, N. Y., offer to build and operate works, providing pumping-engines of the capacity of 3,000,000 gallons daily, with stand-pipe, 16 miles of mains from 6 inches to 18 inches, and at least 200 hydrants, if the city will grant them a franchise and agree to pay \$8,400 annually for 30 years, retaining right to purchase after 10 years.

GRAND RAPIDS, MICH.—The Grand Rapids Hydraulic Company has begun excavations for a gallery system.

DUBUQUE, IOWA.—The City Council last week voted an ordinance donating \$25,000 to the Pontoon Bridge Company if the company will build a high bridge over the Mississippi. The company will do so, and specifications are now being prepared. The cost is estimated at \$115,000.

BATH, ME.—Town meeting, July 26, ratified a contract with the National Water-Works, of Boston, Mass., to furnish a supply of water to the city for fire purposes at \$4,000 annually. Water will be taken from Thompson's Brook.

MILWAUKEE, WIS.—The problem of how to cleanse the Milwaukee River still occupies a prominent place. Mr. E. H. Brodhead suggests that the City Engineer be requested to estimate the cost of a tunnel from the lake to the river, to be used in connection with a pumping-engine, with which the river could be flushed during the hot summer months.

DEDHAM, MASS.—There has been trouble for some time between the town and the Dedham Water Company, and last week the latter carried out its threat to cut off the water for all town purposes if the town would not pay \$5,000 annually for fire and other public purposes. This leaves the town without protection in case of fire.

HAMILTON, ONT.—The contract for the new pumping-engines has been awarded to Osborne & Kelley, of Hamilton, at \$53,000. The lowest bid was that of the Holly Company, of Lockport, N. Y., at \$49,000. See our issue of July 29.

CHATTANOOGA, TENN.—The Mayor and Aldermen have contracted with the Lookout Water Company for a supply of water, the contract to run fifteen years and the city to pay, for the first five years, \$5,000 per year, for the second five years \$7,000 per year, for the third five years \$9,000 per year, the whole sum to be paid to be \$105,000. The purposes for which water is to be supplied are for fire protection, for public schools, for public buildings, for use in constructing streets and sidewalks, and for supply to five drinking and watering fountains (2,000 gallons daily to each). The Chattanooga Water Company offered to furnish a supply for all city purposes at \$9,000 per year for twenty years.

SARATOGA, N. Y.—The Sewer Commissioners, on July 27, awarded a contract for a 24-inch sewer, length about 26,000 feet, to Miller & Knight, of this place, at \$42,076.

TRENTON, N. J.—The Capitol Commissioners have awarded contracts on the State Capitol buildings as follows: Robert S. Johnston, of Trenton, mason-work and materials, including Indiana or Salem stone, \$139,000; Bowling Green, Kentucky, stone, \$145,000; Lumberton stone, \$190,000. Titus & Conrad, of Trenton, all carpentering-work, \$33,900. Thomas Craig, of Trenton, plumbing, gas, and steam fitting, \$6,716. Post & McCord, of New York, iron-work, \$65,559.

CHICAGO, ILL.—George Chambers has received the contract for constructing the tunnel to carry the pipes of the Equitable Gas Company.

OXFORD, O.—Bids for building new public school-house were opened Friday, August 6, and were as follows: Eisel & Meffard, Hamilton, O., \$17,995; Downs, Ready & Co., Connersville, Ind., \$18,570; Lloyd & Hewitt, Oxford, O., \$17,988; J. M. Carr, Hamilton, O., \$19,990; Albert D. Ross, Springfield, O., \$17,926; J. B. Bender, Hamilton, O., \$19,975; John D. Wray, Oxford, O., \$17,663. The contract was awarded to Wray. It is understood that the Smead warm-air apparatus will be used.

ST. PAUL, MINN.—F. S. Blodgett has been found to be the lowest bidder for constructing the Sixth Ward sewerage system; bid, \$78,800.

MILWAUKEE, WIS.—The sewage pumping-works at Jones Island are pumping 50,000,000 gallons per day from the intercepting sewer on Park Street. The capacity is 75,000,000.

GOVERNMENT WORK.

JEFFERSON CITY, MO.—Synopsis of bids for plumbing and gas-piping materials for the court-house, post-office, etc., opened at office of Supervising Architect of the Treasury Department, July 31, 1886: William Kirkup & Son, \$2,276.87, time to deliver, six weeks; Fred. Ade & Co., \$2,392.23, thirty days; Crook, Horner & Co., \$2,811.77. The lowest bid (William Kirkup & Son's) has been accepted.

QUINCY, ILL.—Synopsis of bids for plastering for post-office, court-house, etc., opened at the office of the Supervising Architect, Treasury Department, August 3, 1886: Joseph Eastman, \$2,889; Smith & Crimp, \$3,195.

COLUMBUS, O.—Synopsis of bids for plumbing and gas-piping for court-house and post-office, opened at the office of the Supervising Architect, Treasury Department, July 31, 1886: William Kirkup & Son, \$2,670.93, time to deliver, thirty days; Columbus Brass and Steam-Pipe Works, \$2,722.95; Fred. Ade & Co., \$2,793.10, thirty days; Haines, Jones & Cadbury, \$3,106.26, forty days; Crook Horner & Co., \$3,723.34, thirty days.

DAVID'S ISLAND, NEW YORK HARBOR.—Bids for steam-heating and cooking-apparatus for the new mess hall and kitchen were opened July 26 by Captain George H. Cook, U.S.A., as follows: Wilson Boiler Co., \$5,750; Jacob Jamer, \$5,892; Kelly, Jones & Co., \$5,997; Gillis & Geoghegan, \$5,985; Bramhall, Deane & Co., \$6,457. The contract was awarded to the Wilson Boiler Co. All the bidders were New York parties.

Patents.

No. 344,699 is a patent for a boiler for a house-warming apparatus, issued to Robert S. Watson, of Bay City, Mich., for the combination with a cylindrical jacket or water-space, and an upper water and steam receptacle or dome, constructed without any fire-flues, the series of cylindrical tubes arranged convergently, and connecting the base of the receptacle with the upper part of the jacket, the whole arranged and operating together, to form a boiler.

No. 344,701 is a patent for means for detecting and carrying off leakage from gas-mains, issued to George Westinghouse, Jr., of Pittsburgh, Pa., for the combination of an underground gas-main, a packing of solid material having intercommunicating interstices and adjoining the main, a cover or facing laid upon the packing and composed of tar-paper or other material adapted to resist the passage of foreign matter into the same, and a detector and escape pipe communicating with the packing and leading therefrom to a point above the surface of the ground.

No. 344,706 is a patent for a brick or tile having a roughened, drused, or variegated appearance, issued to James C. Anderson, of Highland Park, Ill., as a new article of manufacture, a brick having main body of the color of the clay when burned and a roughened or drused surface, composed of clay and fluor-spar.

No. 344,707 is a patent for an ornamental brick, issued to the same person, for an improvement in the art of manufacturing ornamental brick, which consists in covering the face of the brick with an enameling compound, joining thereto the ornamental portion, and then burning the same, so as to vitrify the enamel and cause the ornament to be firmly fixed thereto in relief.

No. 344,723 is a patent for a pipe-coupling for gas-mains, issued to Frederick Crocker, of Olean, N. Y., assignor of one-half to Charles D. Robbins, of Burgettstown, Pa., for the combination of an inclosing-case, a pipe-section fitting freely therein, a packing-ring or gasket closely surrounding the pipe-section and fitting against the inner surface of the end of the case, a collar or abutment fixed upon the pipe-section, and a spring bearing against said collar and against the packing-ring.

No. 344,790 is a patent for a ventilating fire-place, issued to Neils Poulson, of Brooklyn, N. Y., for the combination, of an open-grate heater having a series of direct upright smoke-pipes rising from the top of the heater, a chimney-breast containing a high niche for the reception of such heater and its series of smoke-pipes, and a portable metallic mantel-front, which exposes the open grate and has a cabinet for covering the niche to the top, the parts being constructed and arranged, substantially as described, so as to form a ventilating fire-place, which, in addition to its heating capacity by direct radiation, causes an indraught of cold air at the bottom of the niche in the chimney-breast and a discharge of warm air at the top of said niche.

No. 344,813 is a patent for a method of constructing water-works, issued to Richard H. Bull, of New York, and Hayden H. Hall, of New Hamburg, N. Y. The method consists of laying a submarine tube by means of a traveling caisson, which is moved ahead as the tube is built therein, of then fitting the interior of said caisson with a filtering device, and of later admitting the water.

No. 344,816 is a patent for a stuffing-box, issued to Edward H. Cole, of Brooklyn, N. Y. Notches on the interior part or nut are adapted to engage with the packing and prevent any turning motion of the latter and the cap.

Nos. 344,862 and 344,866 are patents for safety-valves, issued to George W. Richardson, of Medford, Mass., assignor to the Consolidated Safety-Valve Company, of Hartford, Conn., for improvements in spring-valves.

No. 344,863 is a patent for a steam-muffler, issued to George W. Richardson, of Medford, Mass., assignor to the Consolidated Safety Valve Company, Hartford, Conn., for a muffler of the character herein set forth with the rings or disks made of zinc or a compound in which zinc predominates, and mounted upon or in connection with other metals, with the top plate made of iron or steel, serving to secure the rings in place.

No. 344,865 is a patent for a safety-valve, issued to George W. Richardson, of Boston, Mass., assignor to the Consolidated Safety-Valve Company, of Hartford, Conn., for the combination of a plate located within a chamber exterior to the valve-casing and arranged to be moved by the escaping steam or fluid, said plate being connected with the tension appliance which operates upon the safety-valve, and arranged to diminish the force of the tension appliance, and to assist in raising the valve when blowing off.

No. 344,873 is a patent for an apparatus for flushing sewers, issued to James Scott, of Denver, Col., for the combination of a number of balanced pans, one above the other, with counterbalancing weights for returning the said pans to their normal position, and another pan in unstable equilibrium, and connected to the series of pans, for the purpose of flushing sewers.

No. 344,884 is a patent for a water-closet, issued to William H. Umpleby, of Trenton, N. J., for a wash-out earthenware water-closet consisting of a single piece of earthenware, the combination of a concave bowl or basin, a tubular rim, openings through the rim to discharge the water into the bowl, a front central slot in the rim, a central connection for the supply-pipe over or opposite the discharge-pipe, a dam at back of the bottom of the bowl, and a discharge-pipe at the back of the closet, with curved ventilating-pipe or pipes connected with the top or side of the discharge-pipe, each ventilating-pipe having its mouth or opening pointing away from the basin, and a shielding plate or lip projecting downward for a short distance from the back wall of the bowl, to catch any water or other matter thrown back from the wall of the discharge-pipe, and to further protect the ventilating-pipes.

No. 344,899 is a patent for a water-back, issued to Henry Engelbert, of Detroit, Mich., for the combination, within a water-back, of a closed compressible chamber or vessel held in place by projecting pins for the purpose of preventing frost-bursting.

No. 344,900 is a patent for a gas-burner, issued to George Galland and Emily Groux, of Wilkesbarre, Pa., for the combination, with a gas-burner, of a valve arranged in the gas-passage thereof, and a thermostatic rod or bar for actuating said valve, located within the burner, having one end extending outside the burner and arranged in proximity to the burning-orifice, said bar being arranged in relation to the valve substantially as described, whereby it will operate to open the valve in the gas-passage when expanded under the influence of heat.

No. 344,925 is a patent for an automatic boiler-cleaner, issued to Henry Sims, of Erie, Pa., for the combination, in an automatic boiler-cleaner, of one or more covered pans opening at one end, and located in the boiler about the water-level, substantially as shown, with an upright settling-tank provided with a blow-off cock near the bottom thereof, and a pipe connecting the ends of said pans in the boiler with the said tank at or near the centre vertically of the tank, and also a pipe extending from the upper end of said settling-tank across the fire-chamber and into the rear end of the boiler near the bottom.

No. 344,970 is a patent for a portable steam-boiler furnace, issued to Walter J. F. Liddell, of Charlotte, N. C., for the combination, with a portable boiler, of a rectangular fire-pot having the flaring or outwardly-inclined side and end walls, a fire-brick lining applied thereto, built up of fire-brick in successive layers, inclining outward and adapted to be held in place against the inclined casing-walls by gravity, and a supplemental door facilitating the lining of said fire-pot.

No. 345,197 is a patent for a globe-valve, issued to William Wade, of Trenton, Mich., assignor of two-thirds to Nathan Neff, of same place, and Frederick H. Seymour, of Detroit, Mich., for the combination, with the shell, seat, and cage of a valve, of a valve-stem having a screw-thread thereon, a rotatable nut applied to the threaded portion of the stem within the cage, and detachably secured to the shell against rotation, and a collar secured to the stem, to turn therewith and slide longitudinally thereon, bearing against said nut and an inner wall of the cage.

No. 344,724 is a patent for a valve issued to James H. Crosby, of Boston, Mass., for a valve shell or case having a perforated inner wall, and a perforated sleeve, inserted in the said wall, combined with a chambered nut or cap, and with a tubular valve-piston provided with ports and a pipe or passage.

BOOKS AND PAMPHLETS RECEIVED.

FIFTH ANNUAL REPORT relating to the Registration and Return of Births, Marriages, Divorces, and Deaths in New Hampshire, for the year 1884. Vol. II. New Series. Concord, N. H.: Parsons B. Cogswell, Printer. pp. 141.

PROCEEDINGS OF INSTITUTION OF CIVIL ENGINEERS. Vol. LXXXV.: The Explosion of Gaseous Mixtures, by Dugald Clerk, F. C. S.; The Economical Construction of Railways, by Robert Gordon, M. Inst. C. E.; James Robert Masse, M. Inst. C. E., and Granville Carlyle Cunningham, M. Inst. C. E.; Recent Researches in Friction, by John Goodman, Stud. Inst. C. E. Published by the Institution, 25 Great George St., Westminster, S. W.

GAS AS A SOURCE OF LIGHT, HEAT, AND POWER. By C. J. Russell Humphrey. New York: A. M. Collender & Co. pp. 99. Illustrated.

ARCHAEOLOGICAL INSTITUTE OF AMERICA. Seventh Annual Report, 1885-1886. Cambridge: John Wilson & Son, University Press. 1886. pp. 48.

ELEVENTH ANNUAL REPORT OF THE MEDICAL OFFICER OF HEALTH OF THE COVENTRY URBAN SANITARY DISTRICT. 1885.

INSTITUTION OF CIVIL ENGINEERS. Minutes of proceedings, etc. Vol. LXXXIV. Edited by James Forrest, Assoc. Inst. C. E., Secretary. London: Published by the Institution, 25 Great George Street, Westminster, S. W.

POOR'S DIRECTORY OF RAILWAY OFFICIALS AND RAILWAY DIRECTORS, 1886. New York: H. V. & H. W. Poor, publishers. 1886. pp. 387.

HEALTH LAWS OF THE STATE OF IOWA: AND TYPHOID FEVER, ITS CAUSE AND PREVENTION. By J. T. Kennedy, M. D. Printed by order of the Iowa State Board of Health for general distribution.

THIRD REPORT OF THE BOARD OF HEALTH OF PATERSON, N. J., 1885-1886. With appendix. Paterson, N. J.: Press Printing and Publishing Co. pp. 62. With plates.

ANNUAL REPORT OF THE BOARD OF HEALTH, RICHMOND, VA., for the year 1885

ANNUAL REPORT, DEPARTMENT OF HEALTH OF CITY OF BROOKLYN, N. Y., for the year 1885.

REPORT OF THE HEALTH OF LIVERPOOL during the year 1885. With map showing the localities of the fatal prevalence of fever. By J. Stopford Taylor, M. D., Medical Officer of Health for the City and Port.

ANNUAL REPORT ON THE HEALTH OF THE BOROUGH OF SHEFFIELD for the year 1885. By Sinclair White, M. D., F. R. C. S., Eng., Medical Officer of Health.

SECOND REPORT FROM THE SELECT COMMITTEE ON THE VENTILATION OF THE HOUSE OF COMMONS May 31, 1886.

LECTURES ON THE COLLECTION, STORAGE, PURIFICATION, AND EXAMINATION OF WATER, delivered to the School of Military Engineering, at the Royal Engineers' Institute, Chatham, Eng., by Col. Sir Francis Bolton and Dr. Percy Frankland, F. C. S. London: Harrison & Sons. 1886. pp. 99, quarto. Paper.

PHYSICAL TRAINING IN AMERICAN COLLEGES AND UNIVERSITIES. By Edward Mussey Hartwell, Ph. D., M. D. Being Circulars of Information of the Bureau of Education. No. 5, 1885. Washington: Government Printing Office. 1886. 8vo., pp. 183. With plates.

EIGHTY-FOURTH ANNUAL REPORT OF THE CHIEF-ENGINEER OF THE PHILADELPHIA WATER DEPARTMENT for the year 1885. Philadelphia: Dunlap & Clarke, Printers. 8vo., pp. 406. With tables and pocket maps.

LATE NEW YORK BUILDINGS.

757 10th av, br flat; cost, \$25,000; o, William Muller; a, James W. Cole.

105th st, s, 66.8 w 2d av, br ten; cost, \$10,000; o, Mary E. Moore; a, J. Averill Webster.

442 W 45th st, br ten; cost, \$12,000; o, Jacob Vixegon; a, Thom & Wilson.

88th st, n, s, and 89th st, s, s, 100 e of 2d av, av, 8 br tens; cost, each, \$11,500; o, Fred. Schuck; a, John Brandt.

380-382 E 10th st, 2 br flats; cost, each, \$17,000; o, Jonas Weil and B. Meyer; a, Geo. B. Pelham.

ALTERATIONS.

228 E 12th st, walls raised and three upper stories extended; cost, \$7,500; o, Isaac Weil, 223 E 10th st; a, A. Zucker & Co.; b, not selected.

9 University Place, new hydraulic elevator; cost, \$6,000; o, Union Theol Seminary, E. M. Kingsley, Treas., 42 W 50th st; a, W. A. Potter; b, C. H. Bunn.

70-72 46th st, 4-story br extension; cost, \$25,000; o, Amos Woodruff, 18 Reade st; a, H. E. Ficken; b, not selected.

13th st, n, s, 285 e 7th av, 2-story br and stone addition; cost, \$20,000; o, Trustees of 13th st Presbyterian Church, Edward Gridley, President, 328 W 28th st; a, J. R. Thomas.

BUILDING INTELLIGENCE.

(Continued from page 246.)

BALTIMORE, MD.—Brown and Elizabeth, 3-story br dwell; o, F. Snellenberger.

146 N. Eutaw, 3-story br dwell; o, I. G. Koch.

Bolton and North av, 5 3-story br dwells; o, A. R. Shipley.

Oliver, nr Belair av, 2 3-story br dwells; o, G. Bauernsmith.

Linden av and Wilson, 4 3-story br dwell; o, H. M. Reinhart.

258 Saratoga st, 3-story br school house; o, Colored Blind Asylum.

Hanover, nr Ostend, 7 3-story br dwells; o, John A. Reed.

Charles, nr Pleasant, 4-story br store; o, Walmsley & Nodwell.

Calvert, nr Preston, 5 3-story marble dwells; o, A. L. Gorter.

Preston, nr Calvert, 7 3-story marble dwells; o, A. L. Gorter.

Charles and Biddle, 3-story stone and br store; o, Edwin Reese.

Townsend and Barclay, 12 3-story br dwells; o, Chas. H. Callis.

Barclay, near Townsend, 9 3-story br dwells; o, Chas. H. Callis.

Caroline, nr Hoffman, 6 3-story br dwells; o, I. S. Magarity.

Division, nr Townsend, 5 br dwells; o, E. B. Burden.

Prezman, nr Etting, 5 3-story br dwells; o, T. W. Bedford & Co.

Preston, nr Holland al, 4 3-story br dwells; o, I. W. Sindal.

BOSTON, MASS.—15-17 Porter st, br dwells; cost, \$12,000; o, G. W. Hargrave.

4-5 Kensington Pk, fr dwell; cost, \$10,000; o, Reuben Green; b, D. J. McGildrey.

William st, nr Baker pl, fr store; cost, \$7,000; o, A. M. Hayes; b, D. J. McGildrey.

Ashley st, nr Read, fr dwell; cost, \$7,500; o, Andrew Crave; b, A. Cook.

20-22 Bowen st, fr dwells; cost, \$11,500; o and b, D. A. Reardon.

191-193 Heath st, fr dwells; cost, \$12,000; o and b, Jas. Devine.

Mt. Pleasant av, nr Vine st, fr dwell; cost, \$8,000; o, M. P. Curtis; b, C. H. Blodgett.

355 Sumner st, fr dwell; cost, \$8,000; o, J. McCoy; b, J. M. Cosden.

32-34 Walnut pl, br dwells; cost, \$15,000; o, Wm. Holmes; b, Holmes Bros.

Walden st, cor Albany st, br mechanical bldg; cost, \$40,000; o, Whedden, Thie & Co.

598-600 Atlantic av, br warehouse; cost, \$110,000; o, Nichols, Dupree & Co.; b, Sampson, Clark & Co.

411-412 Medford st, br factory; cost, \$45,000; o, Robt. Webb; b, Lord Bros.

298-302 Newbury st, br dwells; cost, \$75,000; b, S. W. Merrell.

77-83 Portland st, br warehouse; cost, \$140,000; o, C. Washburn; b, Sampson, Clark & Co.

Thatcher st, br apart. house; cost, \$45,000; o, Boston Co-operative Building Association; b, J. B. Wilson.

BROOKLYN.—The Arion Society will build a club house on Wall st, near Broadway. At a meeting last week the plans of Theodore Engelhardt were adopted. This provides for a building, 80x80 feet, three stories high, to be built of brick and terra-cotta. The estimated cost of building and site is \$65,000.

Work will be resumed on the Seney Hospital. Bids have been received, but the contract has not yet been awarded. John Mumford is the architect.

BUFFALO, N. Y.—13th, livery stable; cost, \$10,000; o, White Brothers; a, R. A. & L. Bethune.

Niagara, br shops; cost, \$15,000; o, Buffalo Hammer Co.; a, R. A. & L. Bethune; b, E. & J. Larmen.

Jersey, cor West av, br res; cost, \$8,000; o, S. L. Mason; a, Swan & Falkner; b, William Schumacher.

Bruck av, fr res; cost, \$5,000; o, B. P. Angell; a, W. W. Carlin.

BALTIMORE, MD.—Charles A. Carson is architect of the new building for the Eutaw Savings Bank, corner of Fayette and Eutaw sts. Work will soon begin.

BENTON HARBOR, MICH.—A town hall and engine-house will soon be erected.

BATAVIA, N. Y.—Br bldg; cost, \$15,000; o, Lewis Ubele; a, J. G. Cutler.

CHICAGO, ILL.—734 and 781 Clark, br dwell; cost, \$15,000; o, Kaiseberg.

241-45 Clark, br and st European hotel; cost, \$70,000; o, Ed. Grace; b, J. M. Van Osdel.

234-36 5th av, br stores; cost, \$75,000; o, F. P. Owings; a, O. J. Pierce; b, A. Lanquist.

2931 Mich. Boul., br dwell; cost, \$20,000; o, W. H. Wilson.

Indiana av, n 37th st, br and st church; cost, \$12,000; o, First Christian Church; a, W. A. Furber; b, not let.

Cottage Grove av, 2 flats and stores, cost \$25,000, and stable in rear \$8,000; o, A. T. Ewing; a, H. B. Seely.

Fifth av, stone block; cost, \$85,000; o, A. T. Ewing; a, H. B. Seely.

Fifth av, near Jackson st, 8-story double store; cost, \$65,000; o, L. W. Pierce; a, H. B. Seely.

Also for 14 buildings costing from \$5,000 to \$10,000.

CHARLESTON, S. C.—Cor Friend and Broad sts, altn of 3-story fr bldg; cost, about \$10,000; o, F. W. Wagner; a, Fuller & Dalano; b, day's work.

St. Phillip's st, bet Line and Spring sts, preparing plans for a 4-story br public school; cost, bet \$35,000 and \$40,000; o, Charleston County; a, Abrahams & Seyle.

There is considerable work going on in this city—work varying from \$800 to about \$2,500.

ANNOUNCEMENT.

The publication of the sixth revised edition of the U. S. Pharmacopoeia (1880), containing as it does much more strict requirements for the purity and strength of pharmaceutical preparations, has been followed in some States of the Union by the enactment of laws against the adulteration of drugs, which laws make the Pharmacopoeia the official standard.

In accordance with our established policy we shall, as in the past, use our best endeavors to furnish only such preparations as shall meet pharmacopoeial requirements. We are heartily in sympathy with all efforts which aim to improve the quality of medicines, and shall continue as heretofore to exclude all low grade and inferior articles and to use our influence to promote the sale and use of pure drugs and medicinal preparations.

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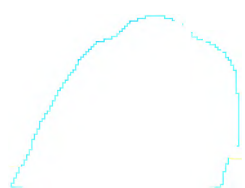
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THE SANITARY ENGINEER.

DEVOTED TO

ENGINEERING, ARCHITECTURE, CONSTRUCTION, SANITATION.

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INTERFERENCE WITH PLANS FOR SEWERAGE.

It is notably difficult to induce towns and cities to adopt improved methods of sewerage, and every effort in the direction of opposition, unless manifestly founded in reason, should be looked upon with disfavor.

The city of Binghamton, in this State, a short time since, adopted a plan for a sewer, which, with its branches, would discharge the sewage of the city into the Susquehanna River. A property-owner upon the river near by sought, by proceedings in court, to enjoin the carrying out of the plan, on the ground that thereby, in the near future, the filth would be strewn along the banks of the river, stranded upon the lowlands, and tend to producing offensive and unhealthy odors, tainting the air and planting the seeds of disease, and that his premises were so situated as to be peculiarly exposed to these dangers by reason of their proximity.

The Court of Appeals, before whom this question has finally come for adjudication, in its opinion refusing an injunction, wisely lays it down as the law, that inasmuch as the danger is not imminent nor inevitable, but wholly contingent, and its probable coming rests upon opinion and speculation, a carefully planned system of sewerage, intended to secure health and cleanliness to a growing city, adopted in good faith by municipal authorities with the aid of an engineer presumably competent and skillful, should not be stopped. Injury, material and actual, and not fanciful or theoretical, or merely possible, must be shown before the court will restrain the carrying out of the plan, and this for the evident reason that otherwise the court would substitute its opinion for the discretion and judgment of administrative officers, to whom the law has properly committed the subject matter for decision.

If, in the future, the plaintiff's apprehended danger should prove real, the court might then interfere and restrain the use of the sewer, or require its use in such manner as would obviate the dangerous results.

This decision should have the effect to deter individuals from seeking to interfere with the carrying out of matured plans for town sewerage upon the fancy or conjecture that the system is not perfect, or that its operation may result in injury to the individual.

STATE QUARANTINE REGULATIONS.

THE United States Supreme Court has, by a recent decision, upheld the constitutionality of the quarantine law of the State of Louisiana. It was urged in opposition to the law, that the requiring of each vessel passing a quarantine station to pay a fee for examination as to her condition and the ports from which she came was in effect the imposition of a tax upon commerce with other States or foreign countries, and hence in violation of the "Commerce Clause" of the Constitution of the United States. The court, however, holds that such State laws, while they may operate as a restraint upon commerce, never-

theless are valid until superseded by Congressional legislation. They belong to that class of laws which, like those in respect to pilotage, can be more wisely enacted by the States themselves, inasmuch as no general regulations applicable alike to all ports would be practicable, and only such could be adopted by Congress. As yet Congress has never passed any quarantine laws, although the Atlantic ports have frequently during the past century been visited by yellow fever and cholera and other contagious and devastating diseases, and the inaction of Congress in this regard is a tacit concession that the sanitary needs of localities differ, and each State being cognizant of its own should and can adopt such legislation as shall meet its particular necessities.

CORRUPTION IN HIGH PLACES.

THE evidence presented in the hearings before the Mayor of New York as to the contemplated removal from office of the Commissioner of Public Works is of a character to disgust all decent people, though it does not astonish any one who has watched the performances of the accused officer. It is surprising, however, that a Mayor of New York should have appointed to so important position a man without any known qualifications for the office, solely for the reason that the Mayor had been acquainted with him several years before, and he was then a pretty "good fellow,"—which seems to have been the only reason offered by Mr. Edson for appointing Squire. It is not surprising that a man who promised in advance to prostitute his position to facilitate stealing from the city should have combined with three other men, who allowed themselves to be classified in a legislative enactment as "a Republican, a Democrat, and a Civil Engineer," to overturn an organization, remove faithful and capable civil engineers, and otherwise conduct matters in the joint interest of Governor Hill and Contractor O'Brien. It is well known that the Governor's law partner had, during the administration of the late commission, Contractor O'Brien's interests to look after, and the late deal with our last legislature demonstrates the fertility of resources at his command. How the Governor can save Squire and Flynn and prevent further "squealing" is doubtless the most important problem he has on hand at this time, and howling about Mayor Grace's motives seems to be one of the methods of evading the issue.

The next popular move, we presume, will be in the interest of a new commission. Yet we take little comfort in the prospect of any large commission, however constituted. Commissions and the disgraceful deals with which they are invariably identified must be tolerated until our press and people are willing to intrust engineering undertakings to men specially trained to carry them out. Under commissioners appointed by the legislature, the taxpayers are bound to pay for blundering when the members are honest, and for stealing when they are efficient; in a large commission the combination of honesty and efficiency not being found.

WE are glad to see the Philadelphia Master Plumbers' Association making a stand for a strict enforcement of the regulations governing plumbing and drainage. Recently the persons interested in doing the drainage-work of a row of dwelling-houses obtained permission from the Board of Health to lay a common drain for these houses in the yards, contrary to Rule 14, which forbids the laying of a joint drain in cellars or yards. Permission to do this was given by the board, because of representations that proper fall could not be obtained if the drain were laid in the public highway. The Master Plumbers' Association then took the matter up, found that the grade of the street was sufficient for laying the drain as the regulations required, and protested to the Board of Health against allowing a departure from the rules; wisely, as it seems to us, taking the ground that an evasion of the requirements in this case, so soon after the adoption of the rules,

OUR BRITISH CORRESPONDENCE.

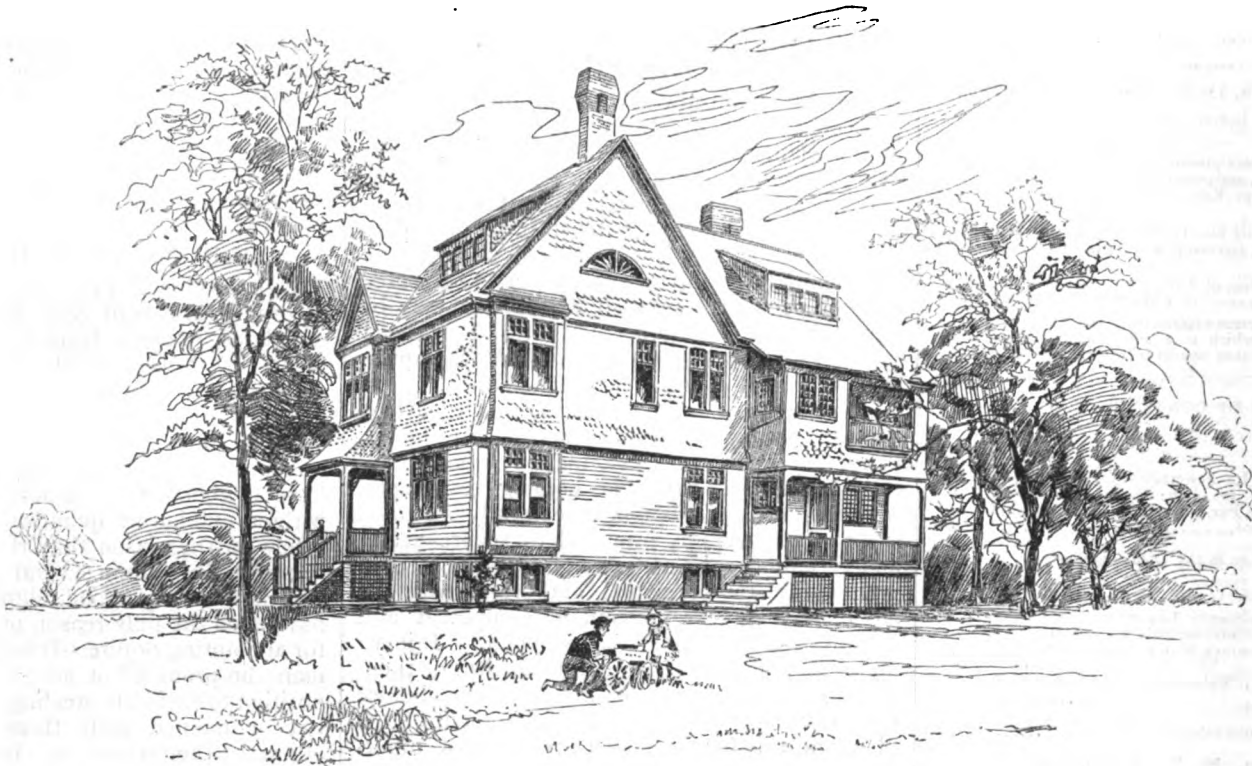
The Huddersfield Water-Supply Law-Suit—The Cremation Society—A Sewage-Carrying Ship for the Metropolitan Board of Works—Hornsea Water-Filtration Methods.

LONDON, July 31, 1886.

A CASE of very considerable interest to municipal authorities possessing water-works has just been finally decided in the House of Lords. In 1882, Mr. Milnes, a Huddersfield solicitor, sued the corporation of that borough for damages against injuries sustained by him consequent upon lead-poisoning by contaminated water-supply. The question of fact was admitted in the various courts of law through which the case was taken, the contention being the legal question of liability of the corporation. The contention for the applicant was that the water in the Blackmoor Foot Reservoir was impregnated with iron pyrites. By exposure sulphuric acid was produced, which, on contact with the lead pipes, had produced salts of lead. The

be entered into during the life of the person desirous of disposing of his body in this way. The society insists on guarantees that the person to be cremated has died from natural causes. Up to the present time six bodies have actually been operated upon. The officers of the society are now appealing to the public to subscribe in order that they may be enabled to clear off their debenture debt, which amounts to £600 (\$2,880).

The Metropolitan Board of Works (London) has contracted with the Barrow-in-Furness Ship Building Company for a steel twin-screw steamer to be used for carrying sewage sludge from the outfalls in the Thames River out to sea. The vessel will be 230 feet in length by 38 feet beam by 13 feet 10 inches depth of hold, built of Siemens-Martin steel, and to class 100a at Lloyds. Her capacity will be 1,000 tons of sludge. She will be propelled by twin-screw triple expansion-engines, having cylinders 15-inch, 22-inch, and 33-inch diameter, and 24-inch stroke, with 150 pounds per square inch, capable of steaming 10 knots an hour. The vessel is divided into compartments,



A SUBURBAN HOUSE AT HYDE PARK, ILL.—HENRY H. SPRAGUE, ARCHITECT.

will be a most mischievous precedent. The board had not taken final action up to the time of our going to press.

DR. JOHN WARD attributes an outbreak of colic on a steamship to contamination of the water-supply by zinc derived from zinc plates fixed in the boiler from which this water was condensed. It appears that the intention had been to renew the water-supply of the ship at Batavia, but that this was not done from fear that the water at that port was contaminated by cholera contagium, and the supply for the remainder of the voyage was obtained by the distillation of sea-water. On testing the water it was found to contain zinc. This brings up the questions, which have been frequently asked and never definitely and satisfactorily answered, as to whether the compounds of zinc taken up from the surface of that metal by drinking-water can be of such a character and quantity as to make the use of the water dangerous to health or life, and as to the circumstances under which such dangerous contamination may occur.—*London Engineer.*

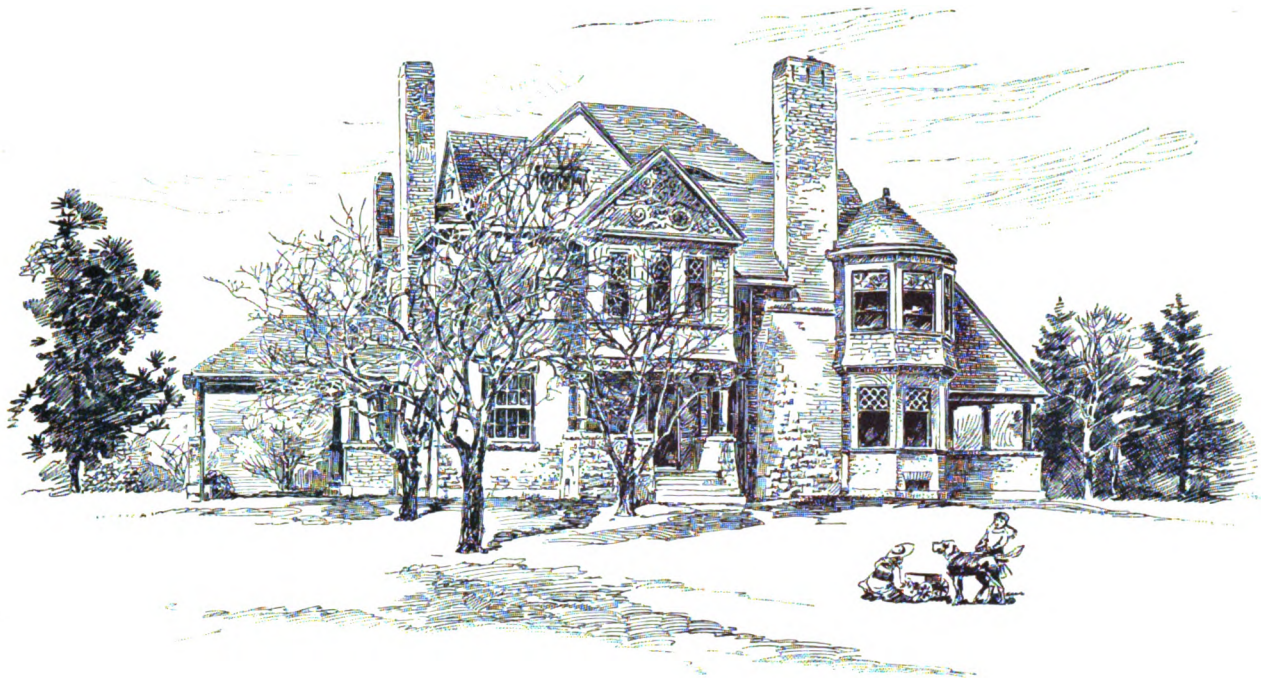
defendants contended that the sulphuric acid in the supply from the reservoir, and, also, as delivered from the mains, was innocuous. Further, that the lead piping was only in the house-connection, and that their responsibility terminated when the water was delivered from the mains. Although the corporation had apparently themselves made this service-connection, judgment was given in their favor on their claim of non-responsibility beyond the mains. Mr. Milnes has, therefore, had to bear the heavy costs incidental to carrying this case through the various high courts, who have reversed the verdict for £2,000 (\$9,600) originally given for him by the jury at the Leeds Assizes; his only consolation being that he has probably done his fellow-townsmen service, as it is hardly probable the corporation will continue making lead connections.

There is a society in England for the cremation of human bodies, of which Mr. W. Eassie, the well-known sanitary engineer, is the honorary secretary. This society has existed for the last two years, and owns freehold premises and buildings suitable for the purposes of cremation at St. John's, Woking. The fee for cremation is £10 10s. (\$50.40), and it is necessary that the arrangement should

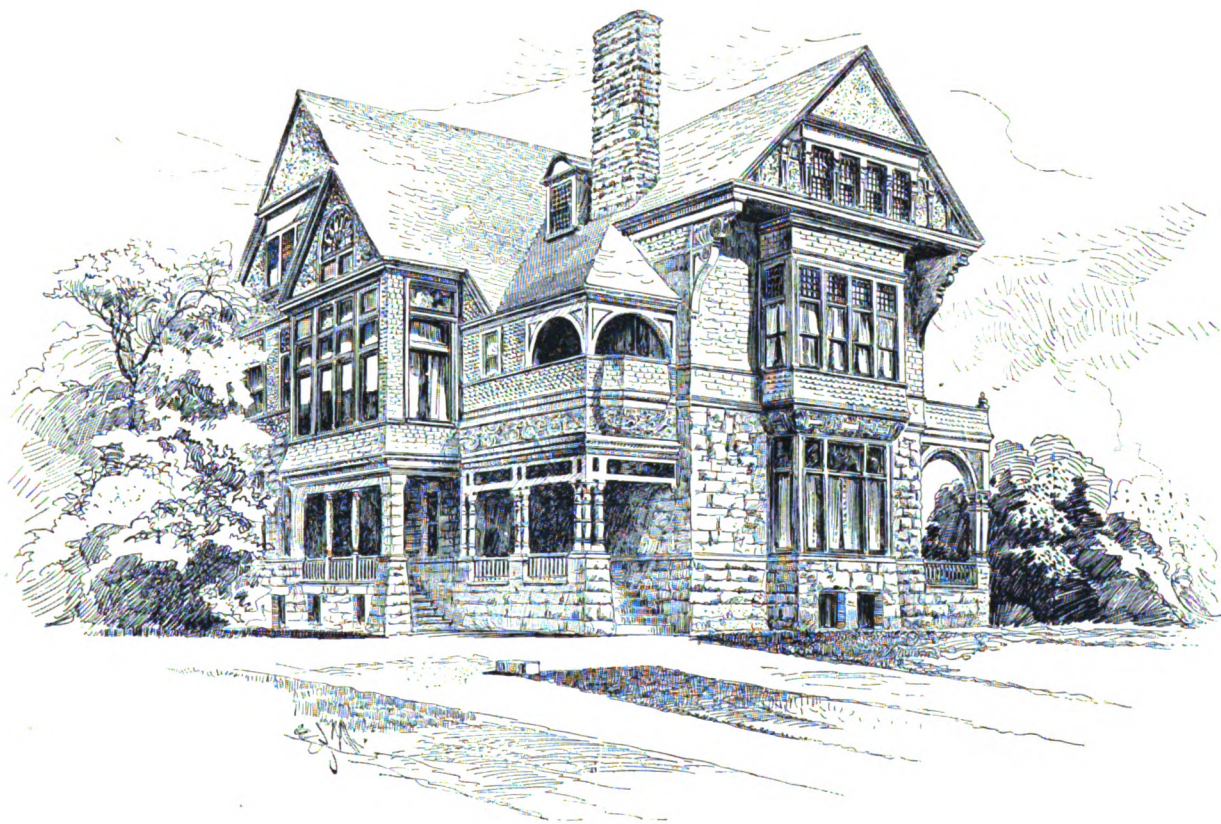
and the cellular double bottom is of such a depth as to allow the sewage to pass out freely, without any pumping, through suitable valves, and to give the vessel proper ballast for the return journey. Arrangements are also made for the washing out of each hold.

An ingenious arrangement for filtering and purifying the water-supply, the invention of Mr. Holmes, the water engineer, is reported from Hornsea. The water is derived from a chalk bed, and has hitherto been pumped into a wooden tank, being supplied thence to the town. It was, however, of such a nature that it scaled on the boilers very considerably, affecting thereby their working. To obviate the difficulty the engineer constructed an inner tank, in which are further smaller tanks, the latter constructed mainly of prepared linen. The water when pumped up to these tanks is fanned out to allow of oxidization by the air, being further purified by the filtering medium of the prepared linen tanks. It is then passed through gravel in its transit between the inner and outer tanks. It is obvious that the utility of such a process would be principally in small towns.

SAFETY-VALVE.



GREEN & WICKS, ARCHITECTS.



SILSBEE & MARLING, ARCHITECTS.

THE SANITARY ENGINEER ILLUSTRATED SERIES.

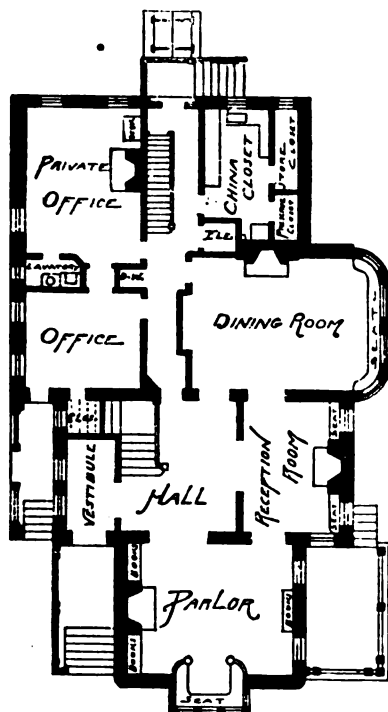
SUBURBAN RESIDENCES AT BUFFALO, N. Y.

OUR SPECIAL ILLUSTRATION.

SUBURBAN RESIDENCES AT BUFFALO, N. Y.

We publish this week views and plans of two residences at Buffalo, N. Y.

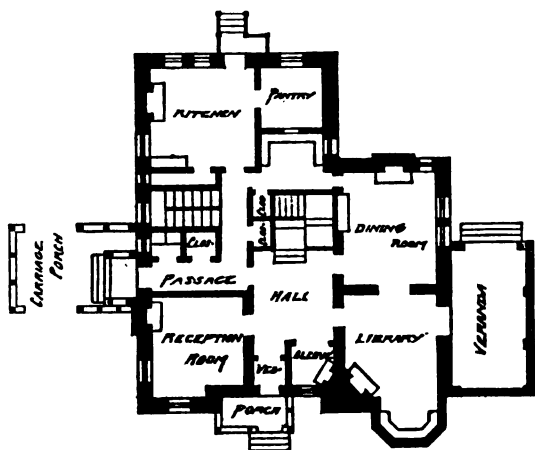
The lower view in our special illustration shows the house of Dr. Bainbridge Folwell, on Delaware Avenue, of which Messrs. Silsbee & Marling, of Buffalo, are the architects. The first story of the house is built of brown



PLAN OF FIRST FLOOR.
RESIDENCE OF DR. FOLWELL.

Medina stone. Above this the building is of wooden frame construction covered with shingles, which are stained with Cabot's creosote stain. The cost of this house was about \$22,000.

The other house, of which Messrs. Green & Wicks, of Buffalo, are the architects, is the residence of Mr. James Adams, on Ferry Street. The foundations are built of brown-stone. The first story is of brownish-red brick.



PLAN OF FIRST FLOOR.
RESIDENCE OF MR. ADAMS.

The second story and roofs are shingled. The house is finished throughout with hard woods, all the floors and the hall and staircase being in what is known as vulcanized wood, a comparatively new process for which great things are claimed in that it fills all the pores of the wood, thus preventing it from shrinking or warping.

All plumbing in the house is exposed, and all plastered walls and ceilings are oil-painted in various tints.

OUR ILLUSTRATION OF A MODERATE-COST HOUSE.

A COTTAGE AT HYDE PARK, NEAR CHICAGO, ILL.—
HENRY H. SPRAGUE, ARCHITECT.

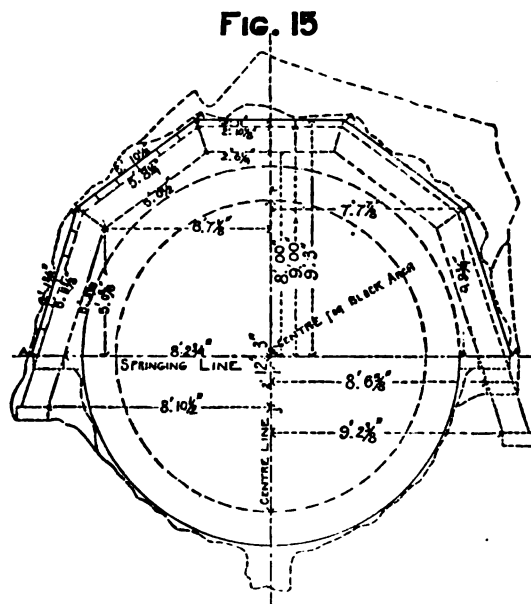
THE NEW CROTON AQUEDUCT.

No. X.

(Continued from page 58.)

TUNNEL TIMBERING, SPECIAL BRICKS, ETC.

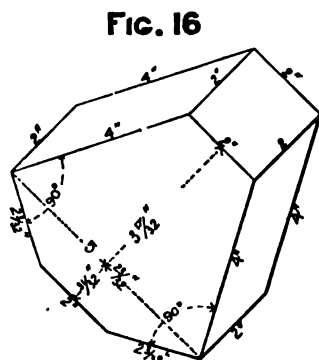
In a previous article a "suggested" form of centering for use in bad rock was illustrated, and we now give another form, Fig. 15, and the one usually adopted. For the aqueduct of twelve feet three inches diameter, the area above the springing line is $136\frac{1}{8}$ square feet, and that below springing 87.38 feet, or a total of $223\frac{1}{8}$ square feet, being quite a saving on the use of the other form.



In all cases where the aqueduct is under pressure when the lining masonry is put in, the lagging and packing material must be removed and replaced by solid masonry to the surface of the rock.

Where the form of section shown in Fig. 15 is ordered, the lines A A represent the extreme lines of the neat section, and all masonry outside of those lines is classed as backing. The contractor alone is responsible for the proper support of the roof, and should the engineer order additional support it does not relieve the contractor from such responsibility.

Figure 16 is an isometric view of a special brick designed for use at the angles joining the invert with the side walls in the horse-shoe section of the aqueduct. The experience



ISOMETRIC VIEW OF SPECIAL BRICK

with the old aqueduct showed that leaks occurred more frequently at these points than anywhere else; and these bricks were designed for the purpose of securing a more efficient bond.

From the fact that the contractors prefer to build the invert last so as not to travel over the finished work, a modified form was adopted as shown isometrically in Fig. 17.

The three views in Fig. 18 show the method of using these bricks at points A A.

Figure 19 illustrates the plates which are fastened in the roof of the aqueduct at every fifth station (500 feet) of its length as a permanent record for future identification in making repairs, etc.

The specifications for work upon the aqueduct have already been quoted from; some of the other items may be summarized as follows:

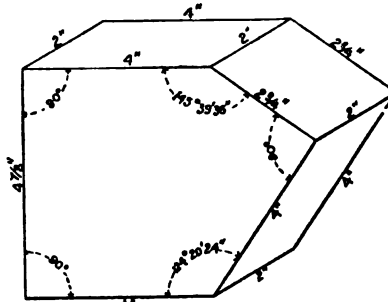
For excavation in open trench two classes only of material are recognized—solid rock, including boulders of one cubic yard or more; and earth, including all material which can be

removed by picking. Trenches are to be refilled in layers of six inches thickness and well rammed, and the prices bid for excavation are to cover every expense of sheeting, bracing, pumping, draining, etc.

Shaft excavation is paid for by the vertical linear foot of depth on the centre line, and the greatest precautions are prescribed to insure perfect safety to the men employed, by thoroughly supporting the sides of the excavation, and the use of safety catches on the hoisting-eages.

Compressed air is prescribed as the power to be used for driving the tunnel, and a special clause, which engineers

FIG. 17



ISOMETRIC VIEW OF SPECIAL BRICK

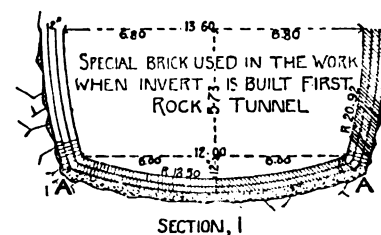
will appreciate, provides that the tunnel shall be kept sufficiently free from smoke and noxious gases to allow the alignment and other engineering work to be done with ease.

Water must in no case be allowed to interfere with the proper setting of the masonry, and no masonry can be laid in water. The engineer may order pipes to be used for conducting water away, and, if necessary, the iron lining of the tunnel and shafts of Section 12 shall be drilled and pipes connected for this purpose. The holes to be closed up afterward if it be so directed.

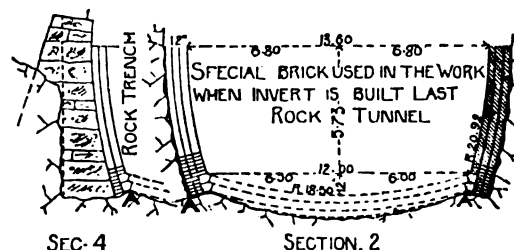
Joints in brick-work are not to exceed one-quarter of an inch, and all face joints are to be cleaned out and pointed in neat cement. All unfinished work is to be racked back, and before new work is added the surfaces are to be scraped by scrubbing with a stiff brush, and well moistened.

All cement is to be rigorously tested, and the contractor is at all times to keep such a supply on hand as to allow full time for this to be done.

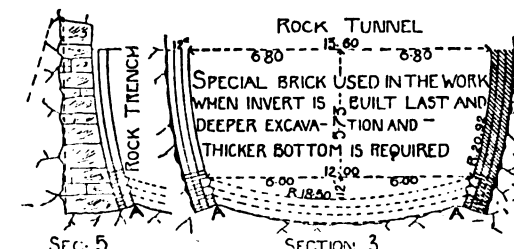
FIG. 18



SECTION 1



SECTION 2



SECTION 3

The cement and sand are to be mixed dry in the proportion of one cement to two sand, and only enough water added to make a paste of the proper consistency, and all mortar must be used on the first set.

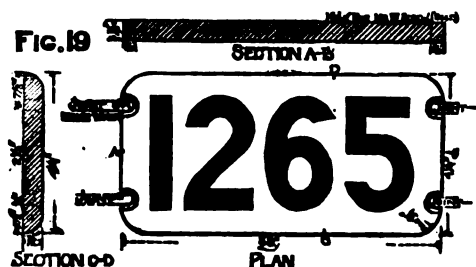
Concrete is to be of broken stone, mixed one cement, two sand, five stone, and to be rammed when laid until water flushes to the surfaces. It must set at least twelve hours before other work is laid on it, or before travel is permitted over it.

All stone-work is to be cut throughout, and the joints are not to exceed three-eighths of an inch. All joints are to be raked out to a depth of one inch and pointed in neat Portland cement.

The wrought iron called for is to have an ultimate tensile strength of 50,000 pounds per square inch, and elastic limit of 25,000 pounds, and a stretch of fifteen per cent. The cast iron for pipes is to be remelted in the cupola or air-furnace, and to have a tensile strength of, at least, 16,000 pounds. All straight pipes are to be cast in lengths of twelve feet, and no pipe will be received which has more than one-eighth of an inch eccentricity, or a variation of more than one-twelfth of an inch below the required thickness. All pipes are to be dipped after cleaning (which must be done without acid) in coal-tar pitch which has been distilled until the naphtha is all removed and the material deodorized, and to which has been added five to six per cent. of linseed oil, and must not be removed until it has attained a temperature of 300° Fah.

All are to undergo a thorough hammer inspection before coating, and to be tested to 300 pounds per square inch internal pressure after coating.

In the general clauses it is provided that no extra work will be paid for unless authorized by the commissioners before its performance, by certificates stating the reasons



for the work and the price agreed upon. The engineer must give his written order for the work, and the total amount of work done on any one order shall not exceed in cost the sum of \$5,000.

The commissioners have the right of suspending all work, if for the interest of the city so to do, without compensation to the contractor.

The requirements of speed are that Shaft 26, which is 116 feet deep, shall be fully excavated in 100 days after signing the contract; Shaft 25, which is 268 feet deep, in 180 days, and one-ninth of the total length of each heading in each month after the shafts are completed. Allowing twenty days for preparation, this amounts to excavating about 1 1/2 feet depth of shaft per day, and from eight to ten feet of tunnel.

(TO BE CONTINUED.)

THE PHILADELPHIA WATER-WORKS REPORT FOR 1885.

THE eighty-fourth annual report of the Water Department of the city of Philadelphia forms a document of 400 pages, and has, what is not common in municipal documents, a full alphabetical index of its contents appended. It being the final report of Colonel William Ludlow, of the Engineer Corps of the U. S. Army, who had obtained a three-years' leave of absence from the army to take charge of the Water Department, occasion is taken to review the changes made in methods of operation during his occupancy of the office, and the progress made toward the solution of the difficult problem of supplying good water to the rapidly growing city.

The largely increased expenditures during these three years over those of the three previous years, owing to the remodeling, to a great extent, of the machinery, which was in an abominable condition, and to the extensive surveys and examinations undertaken, were met to a great extent by the increased collections resulting partly from natural growth and partly improved methods of administration, so that while the expenses were sixty-nine per cent. greater, the net revenue to the city was decreased only fourteen per cent., and averaged \$827,558 per year.

The expenditures for the year 1885 amounted to \$901,931.49, of which \$534,960.34 was for operating expenses, and \$294,896.81 for regular extensions, the remainder being applied to paying previous indebtedness, and about \$30,000 for surveys and experiments. There are 151,853 premises supplied with water, and 20,980 not supplied. The users of water paid to the city \$1,567,031.94 for what they used in 1885. Penalties and miscellaneous collections brought the revenue up to \$1,826,164.04.

It thus appears that the consumers paid for the water nearly three times as much as it cost to furnish it. Only 324 premises have meters attached, so that 99 1/10 per cent. of the consumers are charged for water solely by guess-work, and nobody knows whether they pay at all in proportion to what they use. This is a most unbusiness-like way of doing business, and is very properly condemned by Colonel Ludlow, but the Water Committee of the City Councils refuse to undertake its rectification. As regards the amount of the charges, it may perhaps be as well to raise the money for carrying on the Government by taxing water as by taxing property, but the payment ought to be in proportion to the quantity used.

In addition to the very complete details of the statistics of operation of the department for the year, this volume contains valuable reports and memoranda regarding the probable future supply of water, by Colonel Ludlow, Professors Mallet, Wormley, Greene, and Leeds, and Assistant Engineer Dana C. Barber, which will make it a valuable book of reference in relation to the general subject of water-supply as well as the mere local question of the supply of Philadelphia. The remarks of Colonel Ludlow with reference to the work accomplished during his term of office are so well expressed in the conclusion of his report, that we quote them, rather than attempt to summarise them. He says:

"I regard as perhaps most important of all the thorough investigation of the entire situation as regards both the present and the future, and the recording of those facts in permanent form upon which as a secure basis the work of the future can be planned with certainty, and entered upon without fear of failure. So far as I am aware no field of information has been left unexplored, and while the facts gathered could have been greatly amplified with more time and means, the essential features of the situation have been ascertained and recorded in the annual reports of the department for the past three years. I am glad to believe that in this respect my services have been of some value to the community, which it has been alike my honor and pleasure to serve, and I cannot avoid expression of recognition of the almost uniform consideration by which my work has been supported and encouraged in every quarter of any value, and which, I am gratified to say, has endured to the end.

The situation in 1883 was such as no community could afford to maintain, and unless remedied could only culminate in disaster. The department had for years been run as a political machine in the interest of individuals, and made the harboring-place of henchmen who were quartered upon the city by the score and maintained at the public expense, although in many cases their services were entirely valueless, and in all cases political service and work of some sort were demanded as the price of appointment and retention. Honeycombed with intrigue and inefficiency, destitute of discipline or recognition of authority, disorder and waste prevailing, 'politics' had truly brought the service into a perilous condition, and the Chief Engineer, harassed by his responsibilities, but unable to shake off the bondage that paralyzed his usefulness, proclaimed the danger and announced an impending water famine.

"The Department has been rescued from this condition by the application of methods the reverse of former ones. I accepted office upon the distinct condition that no personal or political consideration should influence my judgment or control my action. The department was taken out of 'politics' and called upon to devote itself to its legitimate work. Every employee of the department was protected in the free exercise of his rights as a man and a citizen; no interference was attempted with his political opinions, nor the proper and temperate expression of them, but undue political activity or conduct calculated to make him obnoxious to his fellow-citizens and impair his usefulness was forbidden. Personal solicitation was discouraged, and appointments made only upon written applications supported by testimonials of character and qualifications from responsible business sources. It is by such means as these, and by these alone, that a service such as that of the Water Department can be maintained in fit or even respectable condition. To the extent to which it is used for so-called political purposes it is corrupted and demoralized.

"While there is a large amount of technical work required, the most important duties of the head of the Department are administrative, and unless he can keep himself aloof from political entanglements and control, his usefulness must be seriously impaired if not entirely

destroyed. The principles above mentioned steadily adhered to, purified the service and rescued it from the slavery that owns a master and dreads nothing so much as the withdrawal of his favor."

DISCIPLINE IN THE PUMPING STATION, AND REGULATIONS GOVERNING ENGINEERS AND FIREMEN.*

THE executive officer of the company or department should carefully select an engineer at the pumping station, who should not only possess the technical knowledge necessary for his position, but should have sufficient experience and tact in handling men and emergencies to warrant trusting him with the plant and management of the details at the pumping station. This engineer should then consult with the executive officer of the company in relation to the number and class of men required to assist him in the regular performance of his duties. When this agreement has been reached, the selection of these men should be left entirely to the engineer. They should be under his sole control, and he should have power to remove them from time to time, with or without cause, without interference on the part of the company. The engineer should be held to a strict accountability for every detail connected with the works, not only in relation to the condition of the plant and appurtenances, but also as to the conduct and deportment of the men.

If the engineer is incompetent or makes an improper use of his authority, he should be replaced by one more suitable, but no official communication should take place between any officers of the company and any assistants of the engineer.

There are a few general principles which should be distinctly understood. For instance, that any man employed on the works if found intoxicated should be instantly dismissed; that while all should exercise the right of voting according to their own political belief, no one should so affiliate themselves with any political party as to interfere with the thorough performance of their duties, etc.

I have but little faith in printed rules and regulations, more or less voluminous. I have none whatever on the works under my control. I have no difficulty in making the heads of the different departments understand distinctly the results which I wish to accomplish, and they have no difficulty in instructing the men as to their duties. I do not believe it desirable to be too explicit in formulating details as to the conduct of the work. Any competent engineer who knows the result to be attained and the general principles to be observed, is only hampered when he is confined in his methods.

The engineer should be required to send to the company a daily report showing the number of strokes made by each engine every hour; the water-pressure, steam-pressure, total gallons pumped, gallons pumped per pound of coal, duty, pounds of coal used and ashes obtained; amount of oil, waste, packing and other supplies used; the rainfall, temperature, and prevailing wind. In addition to these the report should state in detail any peculiar or unusual occurrence that has taken place that day. A copy of this report should be kept in a book by the engineer at the station. At the end of each month the engineer should present a summary statement of the details given above, showing the cost per million gallons of the amount pumped by him, and the difference in weight (as near as it can be ascertained) of the coal as received and the coal as used. It is exceedingly desirable that communications between the executive officer and the engineer should be personal. Written communications are, in many cases, absolutely necessary, but frequent personal conference leads to a much better understanding of the needs of the company and the performance of the work. A careful comparison of the records from month to month with the engineer, if he is the proper person, results in encouraging pride in his work and increased economy in his methods. If he is absolute master of the pumping station, there is positively no excuse which he can offer for lax discipline, or slack work on the part of the men.

Lax discipline usually arises from lack of concentrated authority. If the water company or corporation does not delegate its authority, as far as the operation of the works is concerned, to a single executive officer, there are apt to be a number of members of the board who exercise that office as they see fit to do so from time to time. The result is misunderstanding, conflict in directions, confusion on the part of the employees and general inefficiency. The very common, but utterly reprehensible, practice of appointing assistants at the pumping station without consultation with the engineer in charge, and often in direct opposition to his wishes, leads to the most unfortunate results, and when this is done from political or partisan motives, the only wonder is that any discipline at all exists at the station.

SANITARY HOSPITAL FOR THE BOURNE-MOUTH COMMISSIONERS.

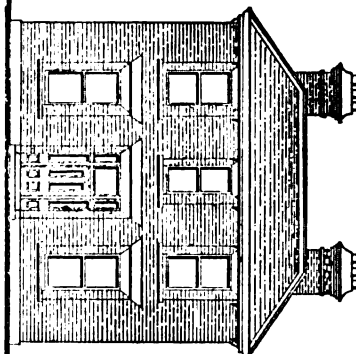
WE give the plans for this hospital (page 275), to be erected on the Shaftesbury estate, near Bournemouth, in the county of Southampton, England, as prepared by Mr. G. R. Andrews, from whose specification we take the following notes.

The foundations and walls up to the finished ground-line to be in concrete composed of washed gravel and

* A paper read by Charles B. Brush, M. A. S. C. E., at Sixth Annual Meeting of American Water-Works Association at Denver, Col., June, 1886.

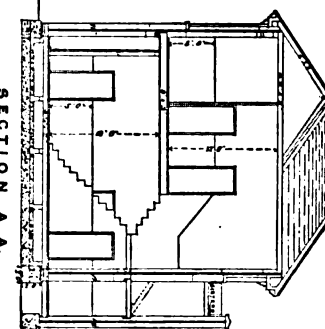
SANITARY HOSPITAL FOR THE DISTRICT OF THE BOURNEMOUTH COMMISSIONERS.

F. M. Andrews.
January 28th 1884.

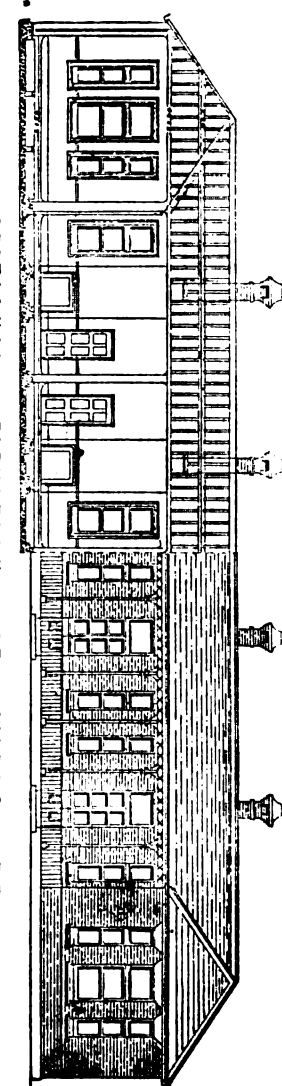


N.W. ELEVATION.

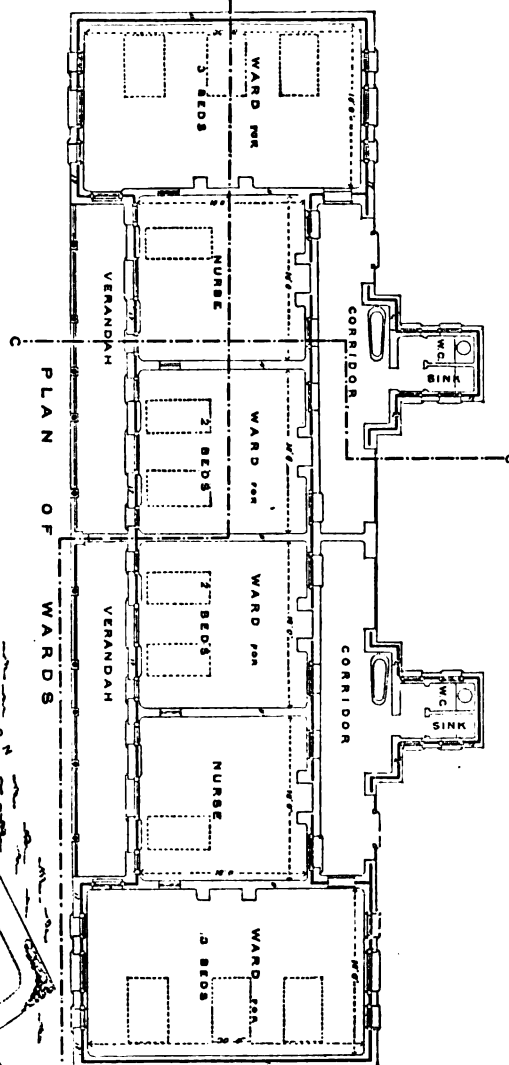
ADMINISTRATIVE BUILDING



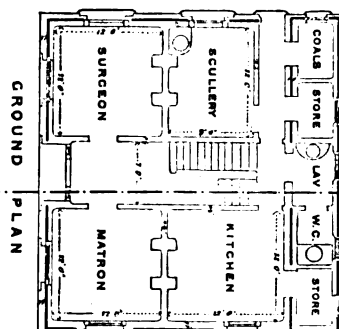
SECTION A.A.



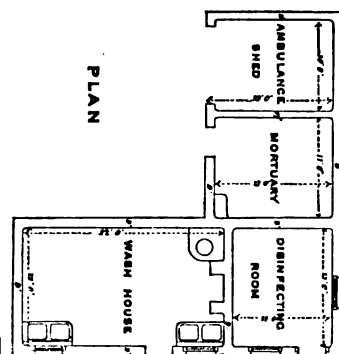
SECTIONAL ELEVATION OF WARDS B.B.



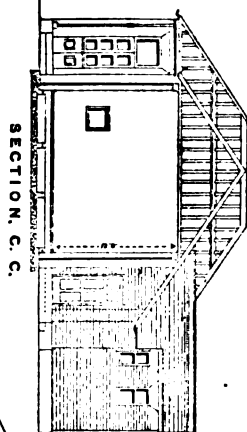
PLAN OF WARDS



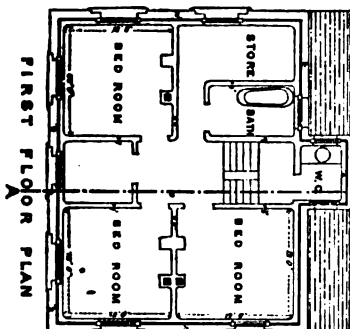
GROUND PLAN



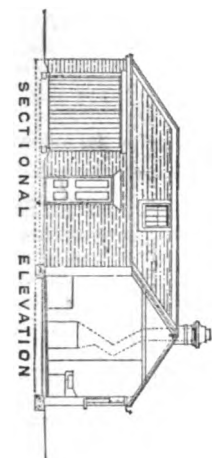
PLAN



SECTION C.C.



FIRST FLOOR PLAN



SECTIONAL ELEVATION

- REFERENCE
- A. WARDS
 - B. VERANDAH
 - C. CORRIDOR
 - D. BATHS
 - E. MATRON
 - F. SURGEON
 - G. SCULLERY
 - H. KITCHEN
 - I. STORE
 - J. MORTUARY
 - K. DISINFECTING
 - L. AMBULANCE
 - M. FIELD FLUEN TANKS
 - N. THREE BEDROOM, BATH AND OTHER ROOMS ON FIRST FLOOR OF ADMINISTRATIVE BLOCK

BLOCK PLAN

From Southampton LONDON & SOUTH WESTERN RAILWAY

SITE FOR FUTURE EXTENSION

FOR DESCRIPTION OF THE HOSPITAL SEE PAGE 274.

Portland cement, in the proportion of seven of the former to one of the latter by measure.

Portland cement concrete under tile floors and paving to be four inches thick, and the floors of ambulance-shed, wash-houses, disinfecting room, mortuary, coals, and scullery finished with three-quarter inch thick of washed sand and Portland cement in the proportion of three sand to one cement, finished with a troweled face, and six inches thick under the whole of the wood floors, seven to one.

The buildings to be of hard-burnt bricks, the facings of best white and red bricks. Taylor's patent damp-proof courses $2\frac{1}{4}$ inches thick to be inserted in both external and internal walls. All external walls to have a hollow space of three inches bonded with galvanized-iron ties.

Over all door and window frames in the external walls, small lead gutters, five pounds to the superficial foot, each nine inches longer than the wooden frame, are to be built in. The $4\frac{1}{2}$ -inch internal walls to be built in Portland cement mortar.

The corridors, verandas, and halls to be paved with tiles. Roofs to be slated.

The wood floors to be $1\frac{1}{4}$ -inch white batten, all joints to be grooved and tongued with No. 18 hoop-iron.

If one joint opens more than one-thirty-second of an inch the whole must be taken up and relaid.

All walls throughout the wards to be coated with one part Portland cement and six parts clean sharp sand, covered with Keene's cement. All external angles, and to door and window openings, to be rounded to a radius of three inches, both vertical and horizontal, and finished in Keene's cement up to the ceiling line.

All internal angles to be curved to a radius of three inches.

THE CHICAGO PLUMBING APPRENTICESHIP SYSTEM.

We print below the blank forms employed by the Master Plumbers' Association of Chicago in connection with the apprenticeship system which the association has established. This has worked so well in practice that the committee of the National Association at the Deer Park Convention recommended it to the whole national body.

The system is as follows:

The term of apprenticeship is for five years, and the Master Plumbers' Association pledges itself to receive into full membership any one who can show that he has served out faithfully such a term. In order to keep track of the apprentices, each employer returns to the association a list of those in his employ on the blank form, No. 1, here given, with particulars as to age of apprentice, date of beginning to serve with the master, and place of residence.

These returns are then copied into an "Apprentices' Record" kept by an officer of the Master Plumbers' Association, and this officer gives to the master a certificate for the apprentice, as shown here (Form No. 2).

At the same time he gives to the apprentice a card which he may retain as a voucher of his good standing. The master keeps the certificate as long as the apprentice remains in his employ. Should the apprentice leave before the full term has expired, the master puts on the certificate the date of the apprentice's leaving and his residence, and returns the certificate to the association. The new master, with whom the apprentice goes to work, receives the certificate from the officer of the association, puts in the date on which the apprentice began work with him, and so the record is kept from master to master until the whole term of apprenticeship is served. The rule of the association forbids a master to take an apprentice who has left another boss without proper presentation of the certificate.

The system is a compromise which is claimed to work very well, aiming to meet the reluctance of both master and journeymen to enter into cast-iron agreements with each other for a long term of years.

THE PLUMBING APPRENTICESHIP QUESTION IN NEW YORK CITY.

LAST spring the Journeymen Plumbers' Association of this city presented to the master plumbers their rules, or demands, in the matter of wages, hours, and apprentices, in a document known as Reference Card No. 1, which we printed in our issue of April 22. This card has been the cause of much discussion since by the Master Plumbers' Association, and finally a Conference Committee was appointed, with Mr. James Muir as Chairman, to confer with the journeymen. Owing to Mr. Muir's absence in

Europe, Mr. James Gilroy has acted as temporary chairman of the committee. The questions of hours and wages, it was believed, could easily be disposed of, but that of apprentices was felt to be a very difficult one to arrange, and this has been the one which the Conference Committee and the association has given most consideration to. An informal meeting was had some time ago with the journeymen's committee, in which the situation was discussed in a very friendly way on both sides, but without reaching any definite result. Then the master plumbers' committee formulated their reply to Card No. 1, which was sent to the Journeymen's Association. This was considered at their meeting of August 5, and rejected, the journeymen (as the letter from their secretary given below shows) preferring to support their original demands. At a special meeting of the Master Plumbers' Association yesterday afternoon the matter was considered, but too late for notice in this issue. We believe, however, the

subject has been thus far treated in such a spirit as will insure a solution of it without trouble.

We here give (1) such parts of Reference Card No. 1 as relate to the apprenticeship question; (2) the rules of the Master Plumbers' Association submitted to the Journeymen's Association, as a substitute for Reference Card No. 1; (3) the reply of the Journeymen's Association declining to accept the substitute.

REFERENCE CARD NO. 1.

"1. That all apprentices to the plumbing trade shall serve an apprenticeship of five years.

"2. That no apprentice shall be taken into the trade until he has attained the age of sixteen years.

"3. That but one apprentice shall be allowed to every four journeymen or fraction thereof.

"4. That all apprentices shall be able to read and write the English language, and to understand the fundamental principles of arithmetic—addition, subtraction, multiplication, and division.

FORM No. 1.

CHICAGO, 188

DAVID WHITEFORD, 346 W. Randolph Street,
Chairman Apprentices Committee.

Sir: In regard to your Circular Letter, I will state that I now have in my employ the following:

NAME.	AGE.	RESIDENCE.	COMMENCED WORK FOR ME.
.....
.....
.....
.....

REMARKS.

(Here give previous service of apprentice, length of time, etc., to assist in keeping such record properly.)

.....

.....

.....

Fraternally Yours,

FORM No. 2.

CERTIFICATE OF APPRENTICESHIP

TO THE TRADE OF

PLUMBING,

Issued to.....

BY THE MASTER PLUMBERS' ASSOCIATION OF CHICAGO, ILL.

This..... day of..... 188

COMMENCED WORK.	FOR	QUIT	NOW RESIDES AT
.....
.....
.....
.....
.....
.....
.....

These Indentures are for a Term of Five Years, and at the expiration of such term of faithful service, shown by dates in the above Certificate, this Association hereby agrees to receive the person named in this Certificate into full fellowship as a Master Plumber.

RESOLVED.—That any Member of this Association knowingly enticing or receiving into his service an Apprentice of a brother member, without the latter's consent, or without full dates and signatures on this Certificate, shall be subject to reprimand or expulsion at the discretion of the Association.

"5. That this association shall have a voice in the selection of all apprentices.

"6. That each apprentice shall be obliged to pass an examination under a board of directors appointed by this organization for that purpose, and be compelled to register and report to the same quarterly.

"7. That each apprentice shall serve the first three and one-half years as assistant to journeymen, and remaining one and a half years as his employer may direct.

"8. That all apprentices shall be legally indentured.

"9. No member of this organization will permit any helper or assistant to use his tools, or any tools that said helper or assistant may provide, or be provided with by his employer or other person, except that said helper or assistant be legally indentured as an apprentice according to the apprenticeship laws of the State of New York.

"10. It shall be the duty of every member when an apprentice is placed under his charge to do everything in his power to instruct him in the practical and theoretical branches of the trade.

"11. All young men under twenty-four years of age, working at the trade with tools, shall receive not less than two dollars and fifty cents per day as wages, and must carry a card to show at all times while working."

RULES.—ASSOCIATION OF MASTER PLUMBERS.

- No. 1. That all boys learning the plumbing trade shall serve five years.
- No. 2. That no boy shall be taken to learn the trade until he shall have attained the age of sixteen years.
- No. 3. That but one apprentice be allowed to every two men.
- No. 4. That all apprentices shall be able to read and write the English language, and to understand arithmetic—addition, subtraction, multiplication, and division.
- No. 5. That the Association of Master Plumbers shall have the selection and entire control of apprentices.
- No. 6. That each member of this association send the names of all boys taken to learn the trade, to be registered in a book kept by the association for that purpose.
- No. 7. If any employer has not work enough at intervals to keep all his apprentices employed, he must use his best endeavors to procure work for them in other shops, or retain them himself under pay.
- No. 8. All members of the association shall furnish a certificate to each boy taken to learn the trade, with the date of commencement, age, and the residence of said boy thereon.
- No. 9. Apprentices' wages shall be as follows :

First year.....	\$3.50 per week.
Second year.....	4.50 "
Third year.....	5.50 "
Fourth year.....	7.50 "
Fifth year.....	10.50 "
- No. 10. At the expiration of five years the apprentice shall receive a full discharge and his *kit of tools*, his name as a journeyman shall be enrolled in a book kept for that purpose by this association.
- No. 11. No member shall employ any helper or apprentice who has previously worked for another plumber without the written recommendation of the latter.
- No. 12. Master plumbers may employ boys to help journeymen with the understanding that they shall not learn the trade, and as compensation receive five dollars per week.
- No. 13. It shall be the duty of every journeyman plumber, when an apprentice is placed under his charge, to instruct him in the practical branches of the trade.

The journeymen replied to the communication of the Master Plumbers' Association as follows :

NEW YORK, August 6, 1886.

JOURNEYMEN PLUMBERS' SOCIETY,
114 EAST THIRTEENTH STREET. }

ALEXANDER LOW, Esq. :

DEAR SIR : The matter in relation to the Reference Card submitted to the Plumbers' Society for their consideration, which was made a special order of business for August 5, received deliberate consideration on that date. I was instructed to return the document to you and inform your organization that the journeymen plumbers believe that the rules contained in Reference Card No. 1 will be more beneficial to the trade at large than the one issued by the Master Plumbers' Association, hence the above conclusion (to return the document). Very respectfully yours,
W. T. FLOOD, Recording Secretary.

HOW THE PLUMBING REGULATIONS ARE WORKING IN PHILADELPHIA.

OUR Philadelphia correspondent has kept our readers informed of the progress which the Board of Health there has made in putting into operation the law relating to the

regulation of plumbing-work. So we think they will be interested in reading how its effects appear to one of the Philadelphia daily papers, the *Evening Bulletin*, which had the following excellent article in its issue of August 7. The *Bulletin* says :

"Like everything else that is an innovation upon a settled custom, and more especially when this custom has made room for loose practices which have gone undetected until their consequences were made apparent, the Plumbing Law, recently adopted by the Legislature and put in force by the Board of Health of this city, gives much room for adverse comment. This criticism, it is to be remarked, comes mainly from irresponsible plumbers and others who prefer to do work cheaply rather than do it well. Under the present law this is made difficult, for the proprieties must be recognized, and when they are not the plumber finds that his neglect will cost him more in the end than if he had complied with the law. The act, which was introduced at the instance of a committee of scientific plumbers at the last session of the Legislature, and approved by Governor Pattison on June 30, 1885, is entitled 'An act authorizing the boards of health in cities of the first class to regulate house-drainage, the registration of master plumbers, and the construction of cesspools.' The act has but three sections, which are little more than the title, except that they set out the penalty for refusal or neglect to comply with the Board of Health regulations authorized by the act. That is, \$100 fine or one year's imprisonment, or both.

"Under the provisions of this act the Health Board created a House-Drainage Department, and enacted forty-one rules for its governance. Most of these are technical and intended for the guidance of the plumbers, who are compelled to register. The rule, however, which causes the most dissatisfaction among the plumbers who are not over-scrupulous is the one that reads : 'The drainage of all buildings, public or private, and the alterations of the same, shall be executed in accordance with plans and specifications previously approved in writing by the Board of Health.'

"This is what makes the cheap contractors call this new law tyrannical. Upon the other hand, it is met with favor by responsible men and those whose wish it is to do good work. It is a common truth that the law never worries a man who has no wish to infringe upon it, and this holds good, no matter how exacting it may be. Contractors of all classes now know just what they will be required to do, and the responsible man will not now make a bid which he knows will be higher than others, because he intends to do good plumbing, and the others intend to do it in a reckless sort of way. The man, also, who means well, but thinks he has not wealth enough to stand out against these loose contractors, will not be tempted to adopt their tactics in order to get a share of the work. As a contractor said this morning : 'I had a good many jobs on hand when this law was passed, and to carry them out cost me more than I bargained for. But even so, I think the act will be a benefit to the people of this city. Before this, when we made a contract it was not so much what would be good for the tenant or what the landlord desired, that we took into consideration, as it was what would be done by some other contractor who would bid beneath us. This made bad work. Also there are some men who did careless work, and some who, for the purpose of gain, slighted their work. Now, however, all have to live up to the requirements of the Board of Health, which means better work, and consequently better health, for many residents of this city.'

"One contractor, last winter, built twenty houses and drained them all into the cellars. There was no sewer, and so he had to drain into a well. It was three days before this law went into effect, however, that he finished them, and so he couldn't be held under it. There are left the provisions of the old law as to nuisances, but no one may anticipate a nuisance, and the board will have to wait till each of these wells becomes one. His argument was that he had done the same thing twelve years ago. Of course he had. Those are just the nuisances the board are ripping out now.

"The members and inspectors of the Board of Health could recall many instances of defective house-drainage which would prove beyond conjecture that the new law is bound to be a benefit. But even now, when the house-drainage department finds bad plumbing it can do nothing without the complaint of a citizen, no matter if it knows that the bad plumbing will double the number of deaths that this will cause, and which gradually increased in the

time when defective drainage and ill-ventilation were allowed to go on at the will of the contractor or at the demand of the greedy landlord. When a complaint is made an inspection follows it. A report to the Board of Health and a reference to the Drainage Committee is made. Then comes a resolution for the Health Officer to proceed, which he does if the owner has not remedied the matter. If he does not at any stage of these proceedings, of all of which he has ample notice, amend his ways, the Health Officer makes the necessary alterations, and the cost thereof is a lien upon the property. This is the proceeding under the general law of nuisances ; the new act confers no new or arbitrary powers in regard to the method of remedying defects, nor does the Board of Health appropriate any by its regulations."

Correspondence.

CREMATORIES.

MILWAUKEE, WIS., July 26, 1886.

SIR : Will you please inform me by your valuable paper of the location of crematories in operation at the present time in the United States? Respectfully yours,

C. F. RINGER, Architect.

[There is a crematorium at Lancaster, Pa., owned by the Lancaster Cremation and Funeral Reform Society ; one at Fresh Pond, Long Island (the Mount Olivet Crematorium), and one at Buffalo, N. Y., illustrated in our issue of March 4, 1886, also Dr. Le Moyne's crematorium at Washington, Pa. We believe one has been projected at Pittsburg, Pa., in which it is proposed to use natural-gas as the fuel.]

LEAD SERVICE-PIPE FOR MISSISSIPPI RIVER WATER.

HARTFORD, CONN., August 8, 1886.

SIR : On page 227 of current issue is printed : "The professor concludes that deleterious effects can follow the use of Mississippi River water drawn through lead pipes."

Wherefore this conclusion, when it is shown that none of the lead is dissolved or acted on by the water?

Yours, H.

NEW ORLEANS, LA., August 10, 1886.

SIR : In your issue of the 5th inst., under the caption, "lead service-pipes for Mississippi water," you make me say "that deleterious effects can follow the use of Mississippi River water drawn through lead pipes." On the contrary, I stated that no injurious effects could possibly follow the use of such water when drawn through lead pipes, since its action thereon was nil. You will oblige by correcting the error in your next issue.

Very respectfully, R. N. GIRLING.

[This is a typographical error. We wrote : "The professor concludes that no deleterious effects can follow the use of Mississippi River water drawn through lead pipes." Unfortunately, the word "no" was dropped in the types, and its absence not discovered until the article was printed.]

HEALTH OF THE UNITED STATES ARMY FOR THE MONTH OF JANUARY, 1886.

THE following is an abstract from the monthly sick returns of the medical officers of the army, condensed from returns furnished to THE SANITARY ENGINEER by the Surgeon-General of the Army :

During the month of January, 1886, in eight military departments, embracing 142 military posts and arsenals and 23 commands operating in the field from which reports were received, there was a total mean strength of 24,532 officers and enlisted men.

There were admitted to sick report 2,625 cases of disease and injury, or 107 per 1,000 of mean strength.*

This is a decrease of 30 per 1,000 below that for January, 1885, and 35 per 1,000 below the average monthly rate for the ten years (ending December 31, 1884), which was 142 per 1,000 of strength.

Twenty-four deaths occurred, as against 15 for the previous month and 14 for the previous January. This represents an annual mortality from all causes of 11.7 per 1,000, or 1.0 per 1,000 less than the average for the preceding decade, which was 12.7 per 1,000 of mean strength.

* The names and diseases of all officers and enlisted men who are excused from any part of their military duty by reason of disability are required to be entered upon the reports from which these data are drawn.

The number of discharges for disability was 43,* representing an annual loss to the army from this cause of 21 per 1,000 of strength.

The number of troops constantly non-effective from sickness was 954, or 39 per 1,000 of strength, being 2 per 1,000 above the rate for last month. The rate for the previous January was 47 per 1,000, and for the previous decade, was 44 per 1,000 of strength.

The rate of recoveries to the whole number under treatment was 700 per 1,000; the rate of deaths, 7 per 1,000.

The average duration of treatment among patients who recovered was 10 days, and among those who died 13 days.

The causes of deaths were as follows: Enteric fever, 1; chronic dysentery, 1; gastritis, 1; pulmonary phthisis, 1; pneumonia, 2; valvular disease of the heart, 4; Bright's disease, 1; apoplexy, 1; poisoning by opium, 1; suffocation (by gas), 1; drowning, 2; delirium tremens, 1; shot wounds, 7 (of which number three were suicides, three homicides, and one killed by Mexicans).

The causes of admission, and those which have chiefly served to impair the health of the army during the month of January, are shown in Table I.

Table I.

Causes of Admission in the Order of their Numerical Importance.	Number of Cases.	Rate per 1,000 for January, 1886.	Average Rate per 1,000 for Ten Previous Januarys.	Increase or decrease of rate.
Injuries and accidents.....	549	22.38	25.17	- 2.79
Diseases of the respiratory system.....	527	21.55	35.19	-13.64
Diseases of the digestive system.....	364	14.84	7	-
Diseases of the nervous system.....	145	5.91	9.60	- 3.69
Veneral diseases.....	141	5.78	7.81	- 2.03
Diarrhoeal diseases.....	138	5.62	12.42	- 6.52
Malarial fevers and resulting conditions.....	104	4.24	9.88	- 5.64
Rheumatism.....	103	4.20	11.66	- 7.46
Enteric fever.....	5	.20	.21	-.01
Typho-malarial fever.....	.....	..	.09	-.09

Among the more important diseases under treatment during the month of January—those remaining sick from the previous month being included—there were 12 cases of enteric fever, 5 new cases being reported; 22 cases of pneumonia, 12 of which were new admissions; and 22 cases of pulmonary phthisis, of which 10 were admitted this month. This is a decrease of 3 cases of enteric fever, and an increase of 6 cases of pneumonia, and 9 of pulmonary phthisis from the whole number under treatment in December.

The ratio of mortality from enteric fever to cases treated was 8.3 per cent.; from pneumonia, 9, 1; and from pulmonary phthisis, 4.5 per cent.

Of contagious and infectious diseases, there were 11 cases of erysipelas, 1 of small-pox, 1 of varioloid, 1 of diphtheria, 1 of whooping-cough, all newly admitted.

A comparison of the health of the several military departments may be seen in Table II.

Table II.

DEPARTMENT OF	Admission-Rate per 1,000 of Mean Strength.	No. of Troops per 1,000 of Mean Strength constantly non-effective from sickness.	Average Number Days of Treatment among Patients who Recovered.	Rate per 1,000 of Deaths to Number of Cases Treated.
The Platte.....	137	38	7	0
Texas.....	129	46	9	0
The Missouri.....	120	45	11	7
The East.....	112	40	11	10
Dakota.....	111	39	11	2
Arizona.....	82	36	10	13
Columbia.....	62	29	9	13
California.....	57	33	13	14
The entire army for the month.....	107	39	10	7
The entire army for the preceding decade, monthly average.....	142	44	?	7.5

Thirty-three posts have shown admission-rates for the month which was greater than the normal of 142 per 1,000 of mean strength and 109 less.

* Recruits at depots discharged for disability which existed prior to enlistment not included.

The posts showing the highest rates were: Indianapolis Arsenal, Ind., 385; Fort Myer, Va., 361; Fort Gibson, Ind. T., 337; Fort McKinney, Wyo. T., 318; Jefferson Barracks, Mo., 267; Camp Rice, Tex., 254; Fort Wadsworth, N. Y., 239; and Fort Sisseton, Dak., 225.

The lowest admission-rates were at San Diego Barracks, Cal., 0; Fort Halleck, Nev., 0; Fort Mason, Cal., 0; Angel Island, Cal., 0; Fort Canby, Wash. T., 13; Fort Stockton, Tex., 15; and Fort Elliott, Tex., 19 per 1,000 of mean strength.

Forty-seven posts have shown a rate of constant non-effectiveness from sickness above the normal of 44 per 1,000 of mean strength and 95 below.

The posts showing the highest constant rates were: San Diego Barracks, Cal., 267; Jefferson Barracks, Mo., 101; Indianapolis Arsenal, Ind., 100; Camp Rice, Tex., 92; Camp Poplar River, Mont. T., 89; and Fort Bowie, Ariz., 84. While the lowest rates were: Fort Halleck, Nev., 0; Fort Mason, Cal., 0; San Carlos, Ariz., 0; Fort McDowell, Ariz., 2; Fort Preble, Me., 3; Fort Canby, Wash. T., 4; Angel Island, Cal., 7; and Fort Niagara, N. Y., 7 per 1,000 of mean strength.

At stations showing high admission-rates catarrh, bronchitis, tonsillitis, and rheumatism, together with injuries, have prevailed.

The causes producing high constant rates were: Pulmonary phthisis, pneumonia, typho-malarial and malarial fever, venereal diseases, and injuries.

During the month of January enteric fever was reported from 9 stations. The cases newly admitted occurred at Soldiers' Hospital, West Point, N. Y., 3 cases; at Fort Wayne, Mich., and Jefferson Barracks, Mo., 1 case each.

Pneumonia existed at 19 stations, as against 16 for December and 9 for November. The cases newly admitted occurred at Fort Leavenworth, Kan., Fort Lewis, Col., Whipple Barracks, Ariz., Fort Concho, Tex., Fort Keogh, Mont. T., Willett's Point, N. Y., Jefferson Barracks, Mo., Fort Thomas, Ariz., Fort Snelling, Minn., Fort Bennett, Dak., Columbus Barracks, O., and Fort McHenry, one case each. Two deaths from this disease were reported: one at Madison Barracks, N. Y., and one at Fort Leavenworth, Kan.

Erysipelas was reported at Fort Laramie, Wyo. T., 2 cases, at Fort Stanton, N. M., 2 cases, and 1 case each at the following: Fort Wayne, Mich., Columbus Barracks, O., San Antonio, Tex., Fort Gibson, Ind. T., Fort Buford, Dak. T., Fort Totten, Dak. T., and Fort Sidney, Neb.

Small-pox, 1 case, at Fort Davis, Tex.

Varioloid, 1 case, at Fort McIntosh, Tex.

Diphtheria, 1 case, at Fort Assiniboine, Mont.

Whooping-cough, one case, at Jefferson Barracks, Mo.

The Post-Surgeon at West Point in his sanitary report, dated January 31, 1886, reports three cases of enteric fever among men belonging to the cavalry detachment, all quartered in the same barrack and unmarried. He further states: "It is my conviction, however, that these instances of fever are accompanied with a decided malarial element. The premises occupied by this detachment have been carefully inspected, the previous habits of these patients scrutinized, and their food and water-supply made a matter of investigation. There is no typhoid fever in the neighborhood, and all inquiry fails to develop any focus of infection."

"Early in the month these three men were all on guard the same day during the severest rain-storm of the winter, and they each attribute the first symptoms of illness to the thorough and chilling wetting they received during that tour of duty."

"Under all these circumstances, therefore, I am loath to believe that they are suffering from the true typhoid fever."

This report also contains the following statement relative to the prevalence of malarial fever during the years 1884 and 1885:

"There have been few cases, comparatively, of intermittent and remittent fevers recently. During the months of September, October, November and December, 1884, there were taken on sick report 17 cases of intermittent and remittent fever, and during the corresponding months of 1885 but 3 cases, all in September and October."

Among troops serving in the field in the Department of Arizona there were reported 5 cases of gunshot wounds, 4 of which were received in action with Mexicans (one resulting fatally), 2 deaths (homicides) by Indian scouts, one instantaneous.

Attached to the army and living at the different military stations were 5,169 women and 6,242 children—the wives, children, and servants of the officers and enlisted men.

Among the women there were reported 394 cases of sickness during the month, or 76 per 1,000 living. There were no deaths reported.

Among the children 379, or 61 per 1,000, were taken sick. Five deaths occurred (all of which were under five years of age), representing an annual death-rate at all ages of 9.6 per 1,000 living.

The causes of deaths were reported as follows: Pneumonia, 1; laryngitis, acute, 1; peritonitis, 1; asthenia, 1; and constitutional syphilis, 1. Whooping-cough was reported among the children at Jefferson Barracks, Mo., 5 cases, and at Fort Niobrara, Neb., 4 cases. This disease was also reported at Vancouver Barracks, Wash. T., and at Fort Snelling, Minn. Diphtheria, 3 cases, at Benica Barracks and Arsenal, Cal.; mumps at Helena, Mont., 4 cases, and Fort Porter, N. Y., 2 cases. The prevalent diseases among this class were catarrh, bronchitis, tonsillitis, and malarial disorders.

PRIVY-VAULTS, BAD SEWERAGE, AND DEATH-RATES.

In his sanitary report for the month of July, Dr. C. A. Lindsley, Secretary of the Connecticut State Board of Health, notices the great increase of fatal forms of diarrhoeal diseases, especially among infants, over that of the preceding month, and attributes to this cause the increased death-rate which is annually observed in the latter month. In explanation he says:

"The more concentrated accumulations of waste organic matter, decomposing rapidly under the influence of heat and moisture, contaminates the air and water to a far more dangerous extent than in places where the population is sparse and such effluvia becomes more diluted."

"The truth of this finds illustration in every city where sewers are employed for the immediate removal of waste organic matter by comparing the death-rate in the population after the introduction of sewers with that before their introduction, or cities in which certain districts are sewered and others are not, by the same comparison of the portions sewered with those not sewered. New Haven afforded the usual example of this during the month of June. The following is an extract from the report of the Health Officer to the Board of Health: 'Although the deaths from zymotic diseases numbered 54, infantile diarrhoea was the registered cause of 42 of them.' The location of these deaths indicates the most insanitary portion of the city in respect to the immediate domestic surroundings of the sufferers. The 42 deaths occurred in 40 different houses. The sanitary inspection reports of 30 of these houses are now on record in this office, and by reference to them it appears that all have privy-vaults save two. Of these two one had 34 persons resident in the house, and probably overcrowding had much to do with the fatal result, and the other had 12 persons, and the plumbing was reported to be 'bad,' and the kitchen 'insanitary.' In these 30 houses there were 36 untrapped sinks. About these 30 houses were 15 cesspools. The other houses were either connected as regards their kitchen with the sewers or threw their slops on the ground. Many of these houses were supplied with water from wells in their yards, in close proximity to the cesspools and privy-vaults. Most of the places which have not yet been inspected are in localities where exactly the same conditions are known to exist. It cannot be a mere coincidence that year after year throughout the heated term there should be this constant relation between masses of filth in subterranean store-vaults and such fearful mortality among the infants. It cannot be a mere coincidence that in all great cities where careful observation is made the same facts exist. It is a most significant fact, too, that everywhere in every city the abolition of cesspools and privy-vaults by the introduction of sewers has markedly decreased the death-rate. There has been no exception yet observed to this rule. It has never been claimed by sanitarians that such conditions as above described about the homes of these afflicted families are the only causes of sickness and death. No one will deny that persons whose unhappy circumstances or tastes require them to live amid such filthy surroundings have also most frequently other insanitary ways of living. Poverty and destitution almost always mean far more than mere want and exposure; they are often synonymous with intemperance and vice and all the attendant evils which do so much to weaken and snap the thread of life."

Gas and Electricity.

Illuminating Power of Gas in New York City.

Week ending	New York Gas-Light Company.	Manhattan Gas-Light Company.	Metropolitan Gas-Light Company.	Mutual Gas-Light Company.	Municipal Gas-Light Company.	Krickerbocker Gas-Light Company.	Equitable Gas-Light Company.
August 14.....	26.78	22.01	21.07	30.84	28.37	22.56	31.44

E. G. LOVE, Ph.D., *Gas Examiner.*

THE ESTIMATION OF SULPHUR AND IMPURITIES IN COAL-GAS.

At a recent meeting of the Manchester Section of the Society of Chemical Industry, Mr. T. Fairley, Gas Analyst to the Leeds Corporation, read a paper on the estimation of sulphur in coal-gas, which was published in the May number of the society's *Journal*. He first described the apparatus introduced by the London Gas Referees, and which is generally employed in this country. By way of suggestion, he says: "If the gas burnt amounts to 2.12 cubic feet, or if the portion of the condensed liquid taken corresponds to 2.12 cubic feet, then the barium sulphate weighed in centigrams gives at once the grains of sulphur per 100 cubic feet of gas without calculation. If a multiple of 2.12 cubic feet be taken, then the calculation is of the simplest character."

He says further: "In acidifying the liquid with hydrochloric acid before adding the barium chloride, it is well to use hydrochloric acid, charged with free bromine, to secure complete oxidation of any products in the condensed liquid. If the supply of gas be not very perfectly governed, the flame may enlarge, and the products for the time being may be imperfectly oxidized."

The author then describes the apparatus of Sadler and Silliman in which the carbonate of ammonia is not used, but in which standard alkali is allowed to run in at the top of the condenser during the combustion of the gas. He finds that this apparatus gives slightly higher results than the Referees' apparatus. Comparing the carbonate of ammonia method with that of Wanklyn (in which iodine is used in place of the carbonate), he finds that the latter gives somewhat higher results.

The author gives a new method which he has used for some years, and in which hydrogen dioxide is the oxidizing agent. "It consists in using a very dilute solution of hydrogen dioxide run in at the top of the Referees' apparatus, and the plain flame under the trumpet-tube without ammonium carbonate. The oxidizing effect is very complete, even in solutions containing less than one per cent. of real dioxide. The equation is $H_2O_2 + SO_2 = H_2O + SO_4$; and hence the liquid may either be titrated with standard alkali, or acidified and precipitated with barium solution in the usual manner. The hydrogen dioxide of commerce, containing from three to six per cent. of real dioxide, is diluted to about one per cent.; and if slightly acid its acidity may be determined, or it may be exactly neutralized before use with a decinormal solution of ammonia. Ammonia has much less effect in tending to decompose the dioxide than any other alkali. If the sulphur oxidized from the gas is to be estimated by precipitation, the dioxide should be free from barium in solution, which would precipitate in the condenser as barium sulphate. The gas to be tested should first be freed from ammonia."

"The hydrogen dioxide is run in very slowly at the top of the apparatus, by a device adopted by Messrs. Sadler and Silliman in running in the standard alkali in their method. About seven inches of fine thermometer tubing is bent double into an inverted U form, and connected with a burette or bottle containing the liquid. Such fine capillary tubing chokes readily with the slightest sediment deposited from the liquid; but by allowing the liquid to pass upward into the fine tube, one leg of which is placed in the wide tube above the condenser, and hangs from it, there is no tendency to choking. By slightly raising the bottle or burette containing the liquid, it is easy to regulate the flow to (say) one drop in three minutes, or from two to three cubic centimetres per hour."

"This method may be used either intermittently or continuously. In the former case the sulphuric acid in the condensed liquid and washings may be determined either by titration or precipitation, or both; and in the latter, the receiver being changed, the volume of gas required is burnt, and then the sulphuric acid estimated in the liquid

collected without disturbing the rest of the apparatus. With a sufficiently large supply of the dilute dioxide in the feeding-bottle, a test may be carried on for days continuously, or even a week, and a fractional part of the whole liquid taken; thus enabling one to get a real average from all the gas passing through the pipes during the long experiment. The following are the results of experiments carried on simultaneously, generally on ten cubic feet of gas; the sulphur being stated as before in grains per 100 cubic feet:

Ammonium Carbonate.	Hydrogen Dioxide (Precipitation).	Hydrogen Dioxide (Titration).
19.21	19.32	19.61
19.42	19.55	19.30
17.98	.....	18.20
18.48	18.90	.....
16.12	17.03	.....
16.41	17.72	.....
16.79	17.23	17.66

"The estimations of carbonic acid and of ammonia in coal-gas are made by processes substantially the same as those described in many text-books. Where the carbonic acid is over one per cent., approximately accurate results may be obtained by the use of Bunte's gas-burette. (Three forms of this apparatus were shown.) When the gas has been purified by lime, the carbonic acid may fall under one per cent., and then a standard solution of barium hydrate must be used, contained in an ordinary absorption or wash-bottle apparatus, arranged to give as small bubbles of gas as possible. After passing a measured volume of the gas through a measured quantity of the barium hydrate solution, and allowing the precipitated carbonate to settle, a portion of the clear liquid may be titrated, and the loss of alkalinity corresponds to the carbonic acid present in the gas. When the carbonic acid has been determined in a gas-burette by the use of sodium hydrate, a further addition of pyrogallol solution shows by the color produced whether or not air is present; and if there is any appreciable quantity, the oxygen corresponding to the air is absorbed."

"Mr. Wanklyn has proposed a method for the estimation of carbonic acid in coal-gas. A clean dry glass bottle, holding about 0.1 of a cubic foot, has fitted to it a stout test-tube as a stopper. The bottle is filled with the gas by displacement; and the test-tube contains a known quantity of standard barium hydrate solution. On shaking the liquid into intimate contact with the gas in the bottle, and then allowing the liquid to settle till clear, the titration of a portion of the clear liquid gives the loss of alkalinity of the solution corresponding to the carbonic acid in the gas taken."

"The ammonia in coal-gas is estimated by passing it through a wide tube filled with glass beads or broken glass, which have been previously moistened with a measured quantity of standard acid. The beads of glass used must be tested for alkalinity very carefully, as some kinds are quite unfit for the process. Messrs. Sadler and Silliman suggested passing the gas through an upright tower somewhat similar to the condenser in the Referees' sulphur apparatus, but used in an inverted position, and filled with broken glass. Standard acid was allowed to run in very slowly at the top from a burette, and ran out by a S-shaped fine tube at the bottom. The loss of alkalinity of the acid gave the proportion of ammonia present. This process they used as a continuous one without washing. I have made some experiments by this method, and generally find that I obtain more ammonia by it when used as a continuous process than by the Referees' ammonia apparatus. On starting the two apparatus, the results at first are practically the same. The following are the results in grains per 100 cubic feet of gas, operating in each experiment on about ten cubic feet of gas:

	Referees.	Sadler and Silliman.
(1)	0.47	0.49
(2)	0.49	1.56
(3)	0.44	1.57

"I have set up a similar apparatus to the gas-burette for the estimation of carbonic acid by a continuous process, using a standard solution of pure sodium hydrate to pass through the scrubber. The liquid in the burette and in the receiving vessel below must be completely protected from the atmospheric carbonic acid. After passing through the apparatus, a measured portion of the sodium

hydrate solution, corresponding to a given volume of gas, is mixed with a measured quantity of standard barium hydrate sufficient to more than precipitate all the carbonic acid present. On allowing the barium carbonate to settle, a fractional part of the liquid gives, by titration, the loss of alkalinity corresponding to the carbonic acid absorbed."

THE Cleveland Gas-Light and Coke Company charge the city \$1 and private consumers \$1.40 per thousand feet of gas. The Council Committee on Lighting are of the opinion that private consumers should not pay more than the city, and will recommend the establishment of a uniform rate.

It is proposed to light the banks of St. Mary's River, Mich., by electric lamps.

DURING the month of July the exports of mineral oils from the United States were as follows: crude mineral oil, 5,968,112 gallons, valued at \$384,231; naphthas, 1,478,555 gallons, valued at \$125,164; illuminating oil, 50,032,881 gallons, valued at \$3,956,834; lubricating and paraffine oils, 1,232,164 gallons, valued at \$223,651; residuum, 237,842 gallons, valued at \$12,943; total, 58,949,554 gallons, valued at \$4,702,823. For the month of July, 1885, the totals were: gallons, 54,309,269 and \$4,658,960.

NOTES.

THE Health Officer of Minneapolis, Dr. T. F. Quimby wishes to have the provision of the New York sanitary code giving the Board of Health power to prevent overcrowding of tenements and lodging-houses, made law in his city.

THE Water Board of Minneapolis, Minn., is considering the question of experimenting on the filtration of the water-supply by means of the Hyatt filter, in which lime is used to "soften the water and to coagulate and precipitate foreign substances," which are then removed by passage through a filtering medium.

OUR Cleveland correspondent writes that "the ordinance regulating sewerage and plumbing has been defeated by the Common Council. It may be revived by reconsideration, but for the present it is killed, and as the ordinance now stands any one may do defective work without any penalty, provided he is not licensed."

DR. ANDREW OTTERSON, Health Commissioner of Brooklyn, has appointed a corps of ten physicians to inspect the tenement-house districts, to give medical advice, as well as report upon the sanitary condition of the habitations. Arrangements have been made by which drugs and medicine will be furnished to those who are able to pay at reduced prices.

OUR Milwaukee correspondent writes: "The Aldermen are considering the idea of appointing a building inspector. We have a factory inspector and plumbing inspector, as well as a sewer inspector. The necessity of a building inspector has been long apparent, and rules governing the construction and inspection of new buildings should be drafted and passed by the Council at once."

ROSEDALE is a suburb of Toronto, and some of the inhabitants want it annexed to the city, while others are bitterly opposed to it. Petitions were recently signed on both sides, the signatures in favor of annexation representing \$175,000 of taxed property, while those against represented \$152,500. It is stated that the Water Committee of Toronto have threatened to cut off the supply of water from the opponents of the annexation scheme.

THE bones of the patriot Pero Maroncelli who died in this city in August, 1846, cannot now be taken back to Italy, under the Italian sanitary regulations, unless a certificate can be obtained that there was no contagious disease prevalent here when Maroncelli died. Giovanni Raffo, the Italian Consul-General, has written to Dr. Nagle for such a certificate. Dr. Nagle cannot give it. Smallpox and typhus fever, to say nothing of minor contagious diseases, were then prevalent. As Signor Maroncelli died of softening of the brain, the sanitary regulations will probably be modified in his behalf.—N. Y. Sun.

Patents.

No. 344,141 is a patent for a drain-tile protector, issued to Alexander L. Shoults, of Bloomingburg, O. As an improved article of manufacture, a drain-tile protector formed of a series of spring-arms having angled ends and a series of diverging wire points or spears secured to each other and to the spring-arms by a cast or soldered joint.

No. 345,369 is a patent for a gas-governor, issued to John S. Connelly, of Brooklyn, N. Y., assignor of one-half to Thomas E. Connelly, Pittsburg, Pa., for the combination of a valve, valve-stem, and float, with compensating weight-vessels and transfer-connection, one of which vessels is provided with several compartments communicating with each other, and is fastened to the valve-stem and connected to the other vessel by chains passing over suitable sheaves, so as to rise and fall alternately therewith.

No. 345,390 is a patent for a flushing apparatus for water-closet cisterns, issued to Jordan L. Mott, Jr., New York, N. Y., assignor to the J. L. Mott Iron-Works, same place, for the combination with an overflow-pipe and valve of a cylinder surrounding the valve, and slotted for the passage of the water, a septum and packing within the cylinder and around the overflow-pipe, a piston attached to such overflow-pipe, a valve applied at an opening in the septum, a cam and lever for regulating the position of the valve and determining the time consumed in closing the valve.

No. 345,391 is a patent for a steam-cooking apparatus, issued to Daniel D. Mounts, of San Francisco, Cal.

No. 345,420 is a patent for a check-valve, issued to John W. Eskholme, of Bridgeport, Conn., assignor of one-half to Edward J. Kiley, same place for the combination, with the seat and disk of a valve, of a knuckle upon the disk having a slot which inclines downward and forward from near the back toward the front thereof, a carrier within the case having a corresponding incline, and a rolling pin which passes through the slot in the knuckle and rests upon the carrier, whereby the disk is carried and movement of the disk is permitted to compensate for wear of the disk or seat.

No. 345,450 is a patent for improvements in hot-air engines, issued to Alexander K. Rider, of Walden, N. Y., for the combination, with an air-engine acting in closed cycle, and having uncovered cylinders and pistons, and an external heating device for heating the air within the engine, of an air-supply pump for maintaining the desired initial pressure in the engine.

No. 345,463 is a patent for a pipe joint and line, issued to Morris S. Verner, of Pittsburg, Pa., assignor to George Westinghouse, Jr., same place, for the combination of a pipe-line composed of sections of pipe connected at the joints by couplings, with a separate gas-tight chamber surrounding a single joint thereof adapted to receive any leakage therefrom, and a vent-pipe leading from such chamber.

No. 345,469 is a patent for draining steam-jackets of engines or pumps, issued to Charles C. Worthington, of Irvington, N. Y., for the combination, with a closed tank arranged to receive the water of condensation from a steam jacket, heater, or similar apparatus, of a pump arranged to withdraw the water from the tank, connections between the tank and pump by which the steam for operating the pump is taken from the tank, a cock or valve for controlling the supply of steam to the pump, and a float within the tank for controlling said cock or valve.

No. 346,501 is a patent for a pipe-wrench, issued to Roswell K. Rouse, of Indianapolis, Ind., for the combination, with a handle-bar and a sliding serrated jaw, of a smooth concave-faced jaw, said concave-faced jaw being pivoted to the handle-bar and arranged relatively to the serrated jaw, whereby the gripping-surfaces of the jaws which first engage the pipe converge at an acute angle, and the remaining surfaces converge at a less acute angle holding the pipe.

No. 345,578 is a patent for a feed-water heater and purifier, issued to Thomas Davis and William W. Tyler, of Cleveland, O., said Tyler assignor to said Davis.

No. 346,579 is a patent for a bath-waste and overflow, issued to Theodore Butler, New York, N. Y., assignor to the J. L. Mott Iron Works, same place. For the combina-

tion, with a bath-tub a perforated standing waste-pipe rising above the bottom thereof, of a removable overflow-pipe passing over the standing waste-pipe, and having a rubber ring around the lower end resting upon a seat around the waste-pipe and forming a valve to the overflow-pipe.

No. 345,584 is a patent for a urinal, issued to John S. Given, Jr., and Frederic F. Martinez, Jr., New York. For a portable urinal for railway coaches, etc., consisting of the following elements: a portable frame-work, of wood or similar material, a bowl and drain-leg made integral and attached to said frame-work, a drip-pan having raised sides to protect the frame-work, and an outlet independent of the drain-leg outlet.

No. 345,593 is a patent for a feed-water heater, issued to Samuel R. Hughes, of Benton Harbor, Mich., consisting of an external steam-jacket for a chamber, in combination with a closed internal steam-cylinder and pipes or passage forming a connection between the ends only of the said cylinder and the steam-jacket, whereby there is a direct circulation of steam from end to end of said cylinder, and both the cylinder and jacket simultaneously supplied with steam from a common supply.

No. 345,732 is a patent for a coupling for pipes, issued to Archibald H. Rowland, Pittsburg, and Rudolph S. Hunzeker, Allegheny, Pa.

No. 345,747 is a patent for an air-valve for radiators, issued to Arthur C. Walworth, of Boston, Mass., having the valve-case attached to the radiator and leading therefrom, and provided with a seat, combined with an independent rod and a plug adjustably attached to said rod, the valve-case being moved bodily by the expansion and contraction of the radiator to place the seat against the plug.

No. 345,777 is a patent for a pipe-wrench, issued to George E. Franklin, of Natick, Mass., for a movable jaw having a screw-threaded shank, in combination with a nut which turns on said shank, and a fixed jaw, which is provided with a head having an oblique passage or opening, which is enlarged at each end to allow play of jaw, and an opening which receives the nut and extends beyond the same, having the shape of the arc of a circle to allow slight motion of nut with jaw while permitting said nut to act as a pivot.

No. 345,790 is a patent for a fire-hydrant, issued to John C. Kupferle, of St. Louis, Mo., for the combination of a hydrant provided with a chamber at its bottom in front of the entrance of the main, and provided with a shell which has a secondary perforated shell secured within it, in combination with a hollow valve-stem carrying a main valve and provided with perforations above and below the valve, and also provided with cup-leathers above and below the lower perforations in the hollow stem, all constructed and combined to operate substantially as described, whereby communication between the upper chamber of the hydrant and the lower waste-perforations of the same is established when the valve is closed, and whereby communication between the upper chamber of the hydrant and the lower waste-perforations is closed as soon as the valve is open.

No. 345,804 is a patent for a sewer-cleaning apparatus, issued to George W. Pringle, of Benicia, Cal., assignor of one-half to L. B. Mizner, same place, for an endless chain passing over guide and direction pulleys within a sewer, and the man-hole through which it passes up over a sprocket or driving wheel, in combination with an elevated frame-work, and boxes in which the driving-shaft is supported at a height above the street cars, and an engine situated at the side of the street from which power is conveyed to said shaft.

No. 345,849 is a patent for a steam-boiler, issued to Robert W. King, of Georgetown, Ontario, Canada, for an inner shell surrounding the furnace and connected at its lower end to the outer shell by plates resting on the wall in combination with a series of tubes arranged to connect the furnace with the space.

No. 345,850 is a patent for an exhaust-steam heating apparatus, issued to John T. King, of Madison, Wis., for the combination of exhaust-steam pipe, an expansion chamber, an exhaust-pipe, and distributing pipes with one or more heaters, drip-pipes, condensing chamber, stand-pipe and well, all constructed, arranged, and operating together.

No. 345,878 is a patent for a sash-cord fastener, issued to Edward T. Bradbury, of Mahanoy City, Pa., for the combination, with the end of a sash-cord fastener having the cord aperture and the penetrating point on the upper face of a wedging section, and having its upper end projecting above the end, and beveled to form a penetrating point or edge.

No. 345,894 is a patent for a gutter for buildings, issued to Joseph Gray, of Amelia, O., for a gutter suspended in a suitable box or lining attached to the eaves in combination with a stationary metal cap.

No. 345,991 is a patent for a combined steam generator and radiator, issued to Edwin Reynolds, Milwaukee, Wis., for the combination with a casing, a fire-box, a generator, provided with smoke-flues and with two sets of air-flues, those of one set crossing the other, and diaphragms separating the smoke and air spaces.

No. 346,600 is a patent for a check-valve, issued to William T. Messenger, of Cambridge, Mass., for a valve-casing provided with raised or projecting valve-seat, combined with a valve composed of a rigid ring or frame and yielding disk fixed at its edges therein and acted upon within its edges by the fluid controlled by the valve.

No. 346,623 is a patent for a heating and ventilating system, issued to Horace C. Strout, of Brooklyn, N. Y., for the combination with a building having a series of communicating rooms, of a heater provided with circulating-pipes located below and connecting with one of said rooms, and suitable egress and ingress ventilators situated in the uppermost part of the building and communicating with one of the rooms most remote from the heater.

No. 346,701 is a patent for a brick for window-sills, etc., issued to James C. Anderson, of Highland Park, Ill., having the under side recessed, the upper edge being flanged and of the full width of the brick, whereby the upper edges of the bricks can be laid close together and the mortar joint protected from rain.

No. 346,714 is a patent frost-proof protector for foot ventilation for soil-pipes, issued to Thomas C. Boyd, of Chicago, Ill., the claims being for an improved article of manufacture, a ventilating-pipe, the upper or exposed end or portion of which is surrounded by an air-tight bulb or jacket of such size as to form an intermediate dead-air chamber between said jacket and the exposed portion of said pipe.

No. 346,715 is a patent frost-proof attachment for soil and other pipes where they pass through the roof of buildings, issued to Thomas C. Boyd, Chicago, Ill., and composed of a frost-proof attachment consisting of a hollow metal cylinder provided with internal annular flanges at or near its top and bottom, internal radial flanges extending upwardly upon opposite sides thereof from the bottom nearly to the top annular flange, and suitable openings at or near the bottom for connecting air-pipes therewith upon opposite sides of said radial flanges.

No. 346,727 is a patent for a boiler-tube cleaner, issued to Stephen S. Cook, of Philadelphia, Pa., in which is the combination of a cleaner having an inner steam-tube and an outer air-tube, the latter surrounding the former and open at one end to the atmosphere.

No. 346,837 is a patent for a steam-boiler setting, issued to Ruben B. Ayres, of St. Louis, Mo.

THE AMERICAN EXHIBITION.

THE American office of the American Exhibition in London has sent us an address stating that the exhibition will be opened May 2, 1887. It will be confined to exhibits from the United States, and is expected to result in the establishment of a permanent "American Emporium" in London for the sale of American products and manufactures. In England, the address says, the plan of the exhibition has been very favorably received by influential men of all walks of life. The American office is at 702 Chestnut Street, Philadelphia.

Association News.

PHILADELPHIA MASTER PLUMBERS.—The regular monthly meeting was held on August 12 in the association rooms, Mr. W. W. Mentzinger in the chair, and Enoch Remick, Secretary. A good attendance of members were

present, and the interest in the meeting did not lag during the evening. After the reading of the minutes the Board of Directors presented their report for the month, stating they had held two meetings, and at both had under consideration a case of violation of the new rules of the Board of Health governing the plumbing business, and which had been permitted by special action of the board itself under false misrepresentations. The rule violated was No. 14, which prohibits any drain or sewer to be laid parallel to any street or alley, through house-yards or under the building, and the violation consisted in allowing a drain providing for thirteen houses to be run through the yards and having separate trap arrangements in each yard. The board had already a protest from the Board of Directors of the association under consideration, and a duplicate was read to the association, when it was approved and referred back to the directors to present to the board, and giving definite instructions to the directors to take steps to investigate why the rule had been violated. During the discussion on the above subject, considerable discussion was had as to the advisability of giving the matter publicity, and one member thought too much of the workings of the association found its way into trade papers, and THE SANITARY ENGINEER in particular. An amount of miscellaneous business was then transacted, and when the consideration of the revision of the rules of the Health Board was called up the matter was postponed until a later meeting. Mr. Lindsley then reported that during a short while past a party had gone to a certain firm, representing that he wished to purchase certain material for a master plumber of the city, and selected and paid for the material desired and then departed. Shortly thereafter, the firm found the goods had not been purchased for the plumber, but for a contractor who is erecting a large number of buildings, and immediately the firm had returned the money and declined to furnish the material—this being in accordance with the agreement of the association with the dealers some time since—and on motion the hearty thanks of the body was tendered the firm for their action. A number of members spoke of violations of the new rules on plumbing which had come under their notice, and the matters were all referred to the Board of Directors to take prompt action, and then after the same board had been directed to have prepared by the next meeting the design of an association seal, the meeting adjourned.

Notes.

For works for which proposals are requested, see also the "Proposal Column," pages 269 and 270.

CONSTRUCTION.

MILWAUKEE, WIS.—It is proposed to appropriate \$8,000 for the erection of a water-tower for the proposed high-service pumping-station; also \$25,000 for a branch First Ward School, and \$25,000 for a new school on Walnut Street, in the Ninth Ward.

DENVER, COL.—The contract for completing the new high-school building has been awarded to Hallock & Howard, at \$237,500.

TORONTO, ONT.—The Aldermen have adopted the recommendations of the Superintendent of Water-Works in favor of laying about \$15,000 worth of water-mains.

DETROIT, MICH.—Thomas P. Tuite & Co. have been awarded a contract for putting a steam-heating apparatus into the County Asylum; cost, \$6,000.

DUBUQUE, IOWA.—Proposals for the much-discussed bridge are out at last, and the Dubuque Pontoon Bridge Company will receive bids until August 23.

COBLESKILLS, N. Y.—Plans have been settled upon for building water-works, and bids for construction have been advertised for. The cost will be about \$50,000.

MILWAUKEE, WIS.—A correspondent writes: "As a general thing the rivers all through our country are used for the disposal of sewage. The principal reason for allowing the sewers to empty their filthy contents into these beautiful rivers is the cheapness of the system. The question of the practicability or the people's health is never considered. In Milwaukee, Wis., the sewers empty into the river, and the stream is so black and foul that the citizens are aroused to the necessity of a remedy to the great evil. An intercepting-sewer has been built and is in running order on the south side of this city, and there is a pumping-station at a point

known as Jones Island, where the sewage is pumped from this intercepting-sewer into the harbor on Lake Michigan. But this is no help for the east and west sides of the beautiful Cream City. There is now a project on foot to have a tunnel built from the lake to the river at a point known as Dane Place, where the lake and river will be connected, and a large pumping-engine put in, whereby the river can be thoroughly cleansed throughout the summer months. There has been little or no rainfall in this part of the country, and the river has always been sweeter after a heavy rain. The present condition of the stream is such that people have to hold their noses while crossing the bridges. The original plan of building intercepting-sewers on each side of the river should be carried out as fast as possible. The temporary remedy of flushing the river will not mitigate the evils that now exist."

TARRYTOWN, N. Y.—The contract for hot-water heating-apparatus for the Westchester County Almshouse has been let to Denny Bros. & Co., of New York City, at \$4,260.

CLEVELAND, O.—An iron bridge will shortly be built between the villages of Brooklyn and Brighton, suburbs of Cleveland. The legislative appropriation for building the same was limited to \$40,000. The proposed bridge will be about 1,500 feet long, and the total bids and estimates for the work amounts to \$39,704.45—viz.: Iron superstructure, Buckeye Bridge Co., \$24,813.40; excavation for foundation for concrete and masonry, Andrews & Doolittle, \$6,158.50; hand-rail, King Iron Bridge Co., \$1,822.50; embankment, West & Sweeney, \$1,080; oak timber, H. B. Carpenter, \$1,198.14; pine timber, G. P. Mills, \$725.91; relaying plank road, Strong Bros., \$106; right of way, \$200, and contingencies ten per cent., \$3,600, \$3,800.

ST. PAUL, MINN.—Contracts for heating and for ventilating the Franklin school building have been given to the Holland & Thompson Manufacturing Co., of St. Paul, at \$5,272 for heating, and to the Chicago Exhaust Ventilating Company at \$8,108 for ventilation.

NEWPORT, R. I.—August 13, the City Council passed a resolution asking the voters of the city to vote at municipal election in favor of an appropriation for extending the sewer outlet at Easton's Point beyond the Goat Island breakwater by a submerged pipe, with other necessary work. The cost is estimated at \$35,000.

LEBANON, N. H.—A strong movement is being made in Lebanon to obtain water for family, fire, and other purposes, from the Mascota River. The cost of the works necessary is estimated at \$40,000.

ORANGE, N. J.—The Township Committee has endorsed the plans for sewage prepared by Carol P. Bassett, of Newark, and the work will be pushed. The ground for the disposal-works has been obtained, the plans will soon be finished, and the contracts will be let in a few weeks.

GOVERNMENT WORK.

SYNOPSIS of bids for terra-cotta tiles for floors for Court House, etc., at Jackson, Tenn., received under advertisement dated July 15, 1886, and opened at the office of the Supervising Architect August 5, 1886: Pioneer Fire-Proof Construction Co., 20 cents per square foot; the Wright Fire-Proofing Co., 22½ cents; Raritan Hollow and Porous Brick Co., 28 cents.

SYNOPSIS of bids for iron-work of stairways for Post-Office, etc., at Quincy, Ill., received under advertisement dated July 15, 1886, and opened at the office of the Supervising Architect, Treasury Department, August 7, 1886: Smith, Hill & Co., \$2,500; Haugh, Ketcham & Co. Iron-Works, \$2,881; Harris & Winslow Co., \$3,150; Hecla Iron-Works, \$3,330; Van Dorn Iron-Works, \$3,376.11; Sneed & Co. Iron-Works, \$3,500.

LATE NEW YORK BUILDINGS.

712 5th av, br and s dwell; cost, \$75,000; o. Fifth Avenue Presbyterian Church; a, R. H. Robertson.

10th av, e s, 75 n 63d st, 2 flats and stores; cost, each, \$15,000; o. S. Haberman; a, G. H. Schillinger.

8th av, e s, 150 w Madison av, 2 flats and stores; cost, each, \$15,000; o. Chas. Kerchoff; a, Geo. Matthias & Co.

ANNOUNCEMENT.

The publication of the sixth revised edition of the U. S. Pharmacopoeia (1886), containing as it does much more strict requirements for the purity and strength of pharmaceutical preparations, has been followed in some States of the Union by the enactment of laws against the adulteration of drugs, which laws make the Pharmacopoeia the official standard.

In accordance with our established policy we shall, as in the past, use our best endeavors to furnish only such preparations as shall meet pharmacopoeial requirements. We are heartily in sympathy with all efforts which aim to improve the quality of medicines, and shall continue as heretofore to exclude all low grade and inferior articles and to use our influence to promote the sale and use of pure drugs and medical preparations.

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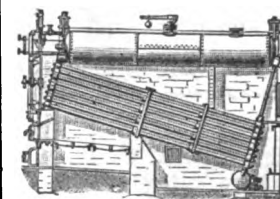
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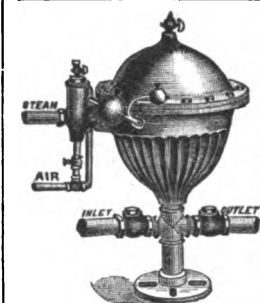
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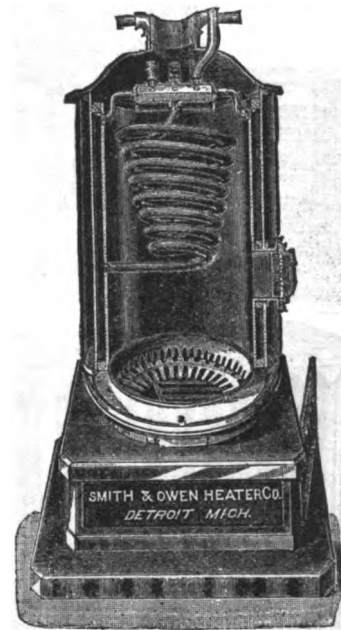
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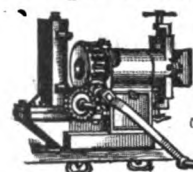
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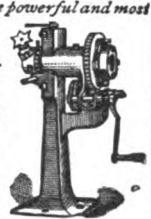
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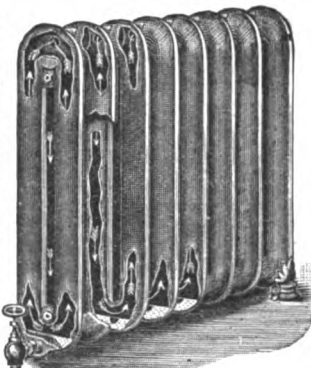


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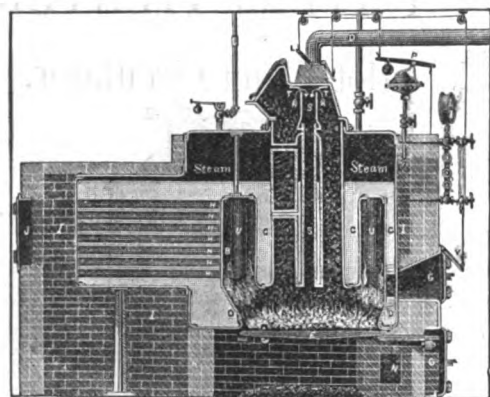
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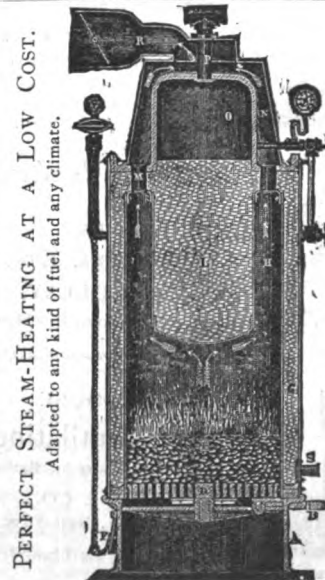
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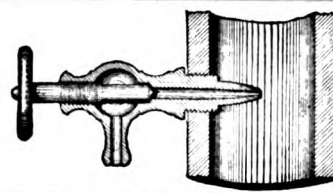
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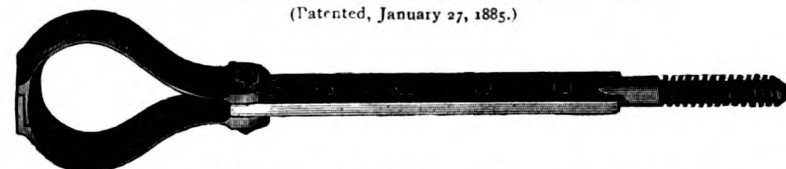
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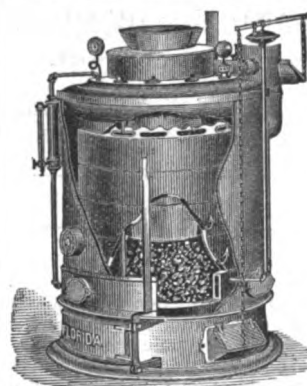
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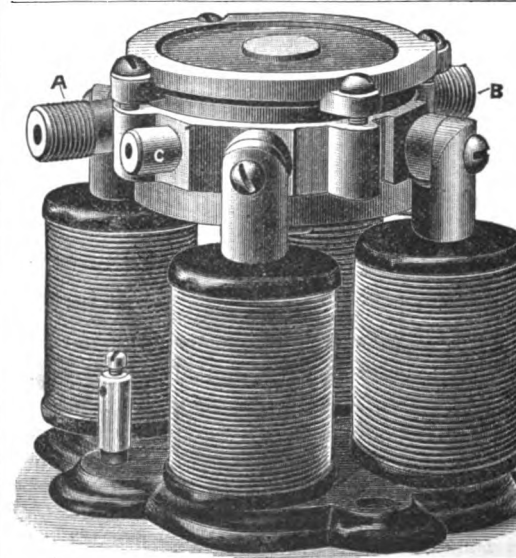
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THE LESSON OF A NOBLE LIFE.

By the death of Mr. E. S. Chesbrough another link connecting the early engineering of America with the present condition of the profession is severed, and it may be well to reflect a moment on the changes which are apparent in the profession and to draw a lesson for the younger members from the history of the eminent member who has passed away.

Fifty-eight years ago the boy of fifteen years of age began his service as a chainman on a railroad survey, and worked his way up, picking up his professional knowledge in the field and the office. He had not the advantages of the technical schools, with their accumulated store of scientific research and records of practice. Of American engineering literature there was none, and of the foreign most was in unfamiliar tongues. But hard study and an acute and observing mind led him on, step by step, to positions of prominence and trust. But he never was rash in undertaking the solution of problems with the treatment of which he was unfamiliar, and when fresh tasks were imposed upon him he was cautious at the outset, and carefully consulted the recorded data of other similar works and then sought the advice of men of experience. This caution in approaching a subject appears to have been a marked characteristic of the man. To those unfamiliar with his methods and his character he often appeared hesitating, undecided, nay, even vacillating in the earlier stages of an investigation. There was none of the positiveness of manner and assumption of universal knowledge which is so often found in less careful engineers, and which frequently goes far to mislead commissioners and directors of large undertakings. But when the problem had been studied out and the difficulties and dangers thoroughly weighed, there was no uncertainty or irresolution in his mind. This quiet, mild-mannered man conceived bold projects and carried them out successfully.

When Chicago polluted its soil, he raised the city bodily to give the sewage an opportunity to flow off into the lake. When the filth of the city contaminated the water-supply, he tunneled under the lake two miles to get pure water. In everything he undertook he investigated patiently, reflected carefully, decided positively, and then stood firm. But there was more than this in his character. Other men have done as much, and never been heard of, but Mr. Chesbrough's name and fame are known all over the world. What was it that gave him this importance? We believe that it was due as much to his moral traits as to his intellectual. The impression left on the mind of every one who was brought into contact with Mr. Chesbrough was that here, at least, was a man who could be trusted, and who could be depended upon to say only what he believed was correct, and to do only what he believed was just, honorable, and honest. Engaged in enormous enterprises, associated with and occupied in the municipal administration of a large city with reputedly corrupt government, no breath of suspicion ever assailed him, and no one

ever dared to insinuate that in thought, word, or deed he was other than a faithful officer, an upright man, a skillful engineer, a Christian gentleman.

His sense of professional honor was high, and in this respect he was a worthy exemplar for the young men of the coming generation, who, in the competition growing out of the multiplicity of graduates of technical schools now thrown on the market, are too apt to forget that they belong to a profession which has a code of honor, and to adopt practices inconsistent therewith.

The career of Mr. Chesbrough will teach them that the way to success and respect lies first of all in thorough integrity and freedom from even the suspicion of collusion with fraud; that in a civil engineer a high sense of professional honor must ever be maintained; that caution, research, and deliberation must precede decision or designs, and that conclusions so reached should be firmly adhered to. Not any one of these, but the combination of them all, is what brought to Mr. Chesbrough success, honor, veneration, and affection.

FALSE REPRESENTATIONS AS TO CHARACTER OF BUILDINGS.

THE recent destruction by fire of the so-called "fire-proof" building in this city, known as Morrell's Storage Warehouse, has given rise to a litigation based upon certain statements contained in an advertising circular issued by the proprietor, the object of which was to call "the special attention of persons having valuable articles, merchandise, or other property for storage, to his new first-class storage warehouse, in the erection of which," it is said, among other things, "no expense has been spared in supplying light, ventilation, and protection against the spread of fire; the exterior being fire-proof, and the interior being divided off by heavy brick walls, iron doors, and railings, appropriate and convenient in every way for the various kinds of articles to be stored." Whereas it appeared that these statements were untrue, of which fact the plaintiff was ignorant.

The Court of Appeals of this State, before which the case has now come, holds the defendant liable in damages upon these facts for the loss of the plaintiff's property stored in the warehouse in reliance upon the truth of these statements.

Analagous cases would be those quite frequent where in the sale or leasing of a dwelling-house the owner falsely represents that the sanitary condition of the premises is perfect. And the purchaser or tenant, relying upon this representation, purchases or leases the property, and in consequence suffers injury to his health or property.

PARTY AND PUBLIC WORKS.

WHEN the contracts for the New Aqueduct were awarded in December, 1884, certain newspapers expressed great indignation because the work

was not given in all cases to the lowest bidders, and assumed that therefore the city would be the loser, to the extent of the difference between the successful bids and the lower ones which were rejected. THE SANITARY ENGINEER, on the other hand, took the ground that the awards were unjustifiable because the prices at which the work was awarded were manifestly less than it could be done for.

Twenty months have elapsed, and the newspapers which raised the outcry of extravagance on the part of the commissioners are now filled with statements of the losses of the contractors and elaborate calculations to prove that they cannot possibly do the work at the prices they receive.

On December 18, 1884, THE SANITARY ENGINEER said: "We believe that unless the contractors have more influence with the commissioners than the engineers have, or unless they secure legislative relief, they will lose money."

The magnitude of the interests at stake render it not unlikely that extraordinary efforts will be made to elect a majority of the legislature of the desired proclivities. It is not a matter of party, but of peculation, and the actions of the present commissioners demonstrate that a so-called non-partisan combination is more dangerous than a collection of honest men of the same political faith. There is time before the election for citizens, irrespective of party, to ferret out this scheme and combine to defeat it. It cannot be done by raising an outcry on absurd issues like that of the subletting of the work by the contractors. Indeed, it would not be surprising if the discussion in the newspapers on this point should be found to have been started by the contractors themselves to distract attention from the vital question. There is a clause in the contracts to the effect that the contractor shall not "assign or sublet the work or any part thereof without the previous written consent of the

OUR BRITISH CORRESPONDENCE.

Sewerage and Water-Supply Works at Petersfield—Proposed Water-Supply for Sutton-in-Ashfield and Hucknall-Huthwaite—A Tricycle Fire-Engine—The Society of Tailors and Machinists Attempt to Improve Condition of Workshops.

LONDON, August 7, 1886.

THE works of sewerage and water-supply for the town of Petersfield have just been completed. The water-supply for the town (the population of which is about 2,000) has been the subject of some difficulty. It was at first endeavored to be obtained from the chalk, but ultimately a shaft was sunk, and an abundant supply of pure soft water was secured at a depth of seventy-five feet in the geological formation known as the Hythe Beds. It is pumped from this to a storage-reservoir holding 180,000 gallons, whence it is delivered to the town, the highest buildings in which are commanded by the reservoir. The sewerage works



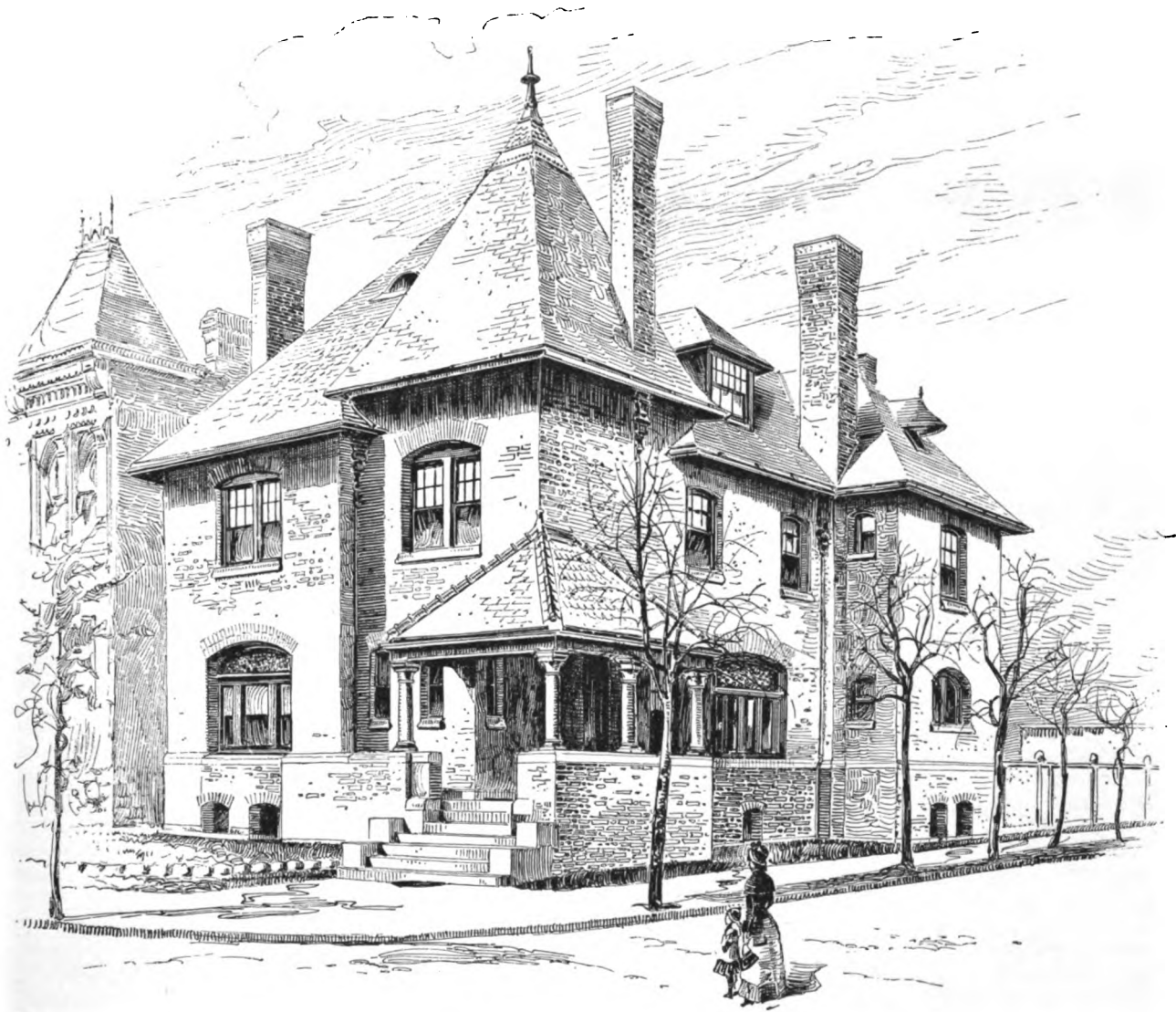
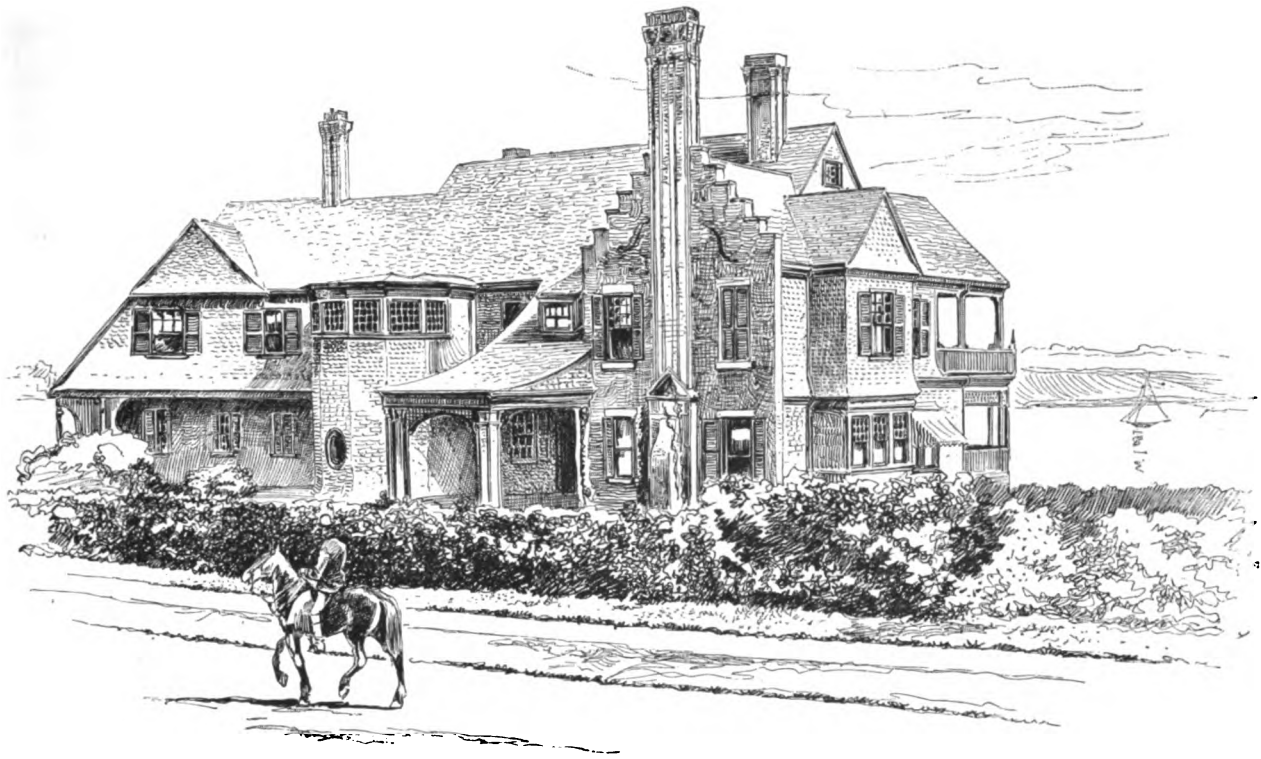
A COTTAGE AT LONGWOOD, MASS.—W. WHITNEY LEWIS, ARCHITECT.

The present condition of affairs verifies this prediction in a remarkable manner. The contractors have secured legislative action, which gives them more influence with the commissioners than the engineers have, the majority of the commission being constituted of creatures of the contractors, and they have brought this about just at the time that the profitable work is largely done and the unprofitable part bears a larger proportion to the remainder of the work. How they will proceed to get out of their troubles is still an enigma. If the Governor should fail to carry out his part of the bargain and should assent to Squire's removal before he can do any more harm, and the Mayor should appoint a man efficient as well as honest, thus reversing the majority in the Aqueduct Board, it might go hard with the contractors. There are two things they evidently desire: one is to keep Squire in office until the legislature meets, and the other to "fix" the legislature itself by the influence of the Chairman of the State Democratic Committee, who is one of the contractors.

Aqueduct Commissioners." But this does not mean that he shall not have special work done by persons skilled in or having conveniences for that particular work, but shall directly hire all the employees himself. Such an interpretation as the newspaper writers are attempting to put upon this clause would oblige the original contractor to burn and grind the cement, to burn the brick, to quarry and cut stone, to break concrete stone, and to own and operate all the drills himself. This is absurd. In these days of division of labor there are a great many operations which can be carried on infinitely more effectively and economically by engaging a skilled "boss" and his regular workmen to do piece-work than by attempting to hire individuals and furnish all the plant. This is not where the trouble with the aqueduct lies. Trickery must be looked for in the council chamber rather than in the field.

have been carried out on the "separate system," the bulk of the rainfall being excluded from the sewers. The sewage is collected by sewers of six inches and nine inches diameter and conveyed by gravitation in an outfall-sewer, twelve inches in diameter, to screening-tanks, which retain (by upward filtration through gravel) the grosser suspended matter. The sewage then passes over two acres of loamy land specially prepared by deep draining, in which it is purified; the effluent being discharged into a brook adjoining. Hitherto, the refuse has polluted the river Rother which flows through the middle of the town, and has long given rise to serious nuisance, and called for the execution of works of sewerage. The completion of the works of water-supply and sewerage has caused great satisfaction to the inhabitants, and will doubtless improve the health of the town. The engineer to the board, under whom the works were carried out, is Mr. Henry Robinson, C. E., of Westminster.

Mr. Stephen H. Terry, sitting as Local Government Board Inspector, held inquiries at Sutton-in-Ashfield and Hucknall-Huthwaite with regard to the applications made for certain borrowing powers to enable the authorities of



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CHICAGO, ILL. 60637

the former place to extend the main for supplying water to the latter, and further to enable the authorities of Hucknall to put down the necessary works for the general supply. The sum required by the Sutton authorities is £800 (\$3,840). The loan is required for thirty-five years, the outstanding loans of the district at present amounting to £15,674 (\$75,235.02). Mr. Hodson, the engineer to the water-works, stated that water was now being pumped at the rate of 740,000 gallons per day, but that the demand was not likely to exceed 300,000 for some years, and, if necessary, the supply of water, which is very suitable for most industries, could be increased to 1,000,000 gallons. The projected reservoir at Hucknall would be thirty-eight feet higher than that at Sutton. A check-valve would be provided to prevent back-water. The price to be charged to the Hucknall authorities would be 7d. (10 cents) per 1,000 gallons, which, it appears, is only about the cost price. The application of the Hucknall authorities indicates a spirit of enterprise which is praiseworthy. The number of inhabited houses in the parish is about 420, and the population about 2,150. The assessable value is £3,992 (\$19,161.06), the amount of the outstanding loans £500 (\$2,440), and the loan for which borrowing powers are now sought £2,500 (\$12,000). The total estimated cost of the necessary works for the local water-supply was £2,450 18s. (\$11,764.32). The public spirit of the place was well illustrated by the fact that no opposition was offered to burdening this little parish with the projected loan.

A new development of the tricycle takes the form of a fire-engine, a patent having just been introduced with this object by Mr. William Glenister, of the Hastings Fire Brigade, and Merryweathers, of London. The tricycle carries a hose-reel, with specially constructed hose for winding in a small compass, and light double-pump engine, capable of throwing twenty-five gallons of water per minute, and collapsible cistern, together with all necessary attachments for street-hydrants. Further, it has a fire-escape, with descending ropes and bags and jumping-cloths, which, in their compressed form, constitute the riders' seat. The machine is ridden by two men, and, with a special gear, the treadles can be attached to the pumps. It remains to be seen whether this apparatus will be serviceable in actual use, or share the fate of the large number of *multum-in-parvo* novelties.

The Society of London Tailors and Machinists, in endeavoring to obtain some amelioration of their condition so far as their workshops are concerned, are undoubtedly doing not only themselves, but the public, for whom they work, a great service. These "sweaters'" dens, as they are euphoniouly called in East London, are, without doubt, some of the greatest factors in the mortality of the district. The men and women therein employed work sixteen and seventeen hours a day, and, in many cases, six to nine people live in one room. Consumption, especially among the Jews, is consequently very frequent. These men ask that their hours of labor should be limited to twelve. One speaker at a meeting recently held, who was also the secretary, in illustration of his case and apparently in the hope that the reference to such an official would be of more service to them than if it had happened in the case of an ordinary member of the public, stated that he had helped to make a coat for the Mayor of Bristol in a loft above a stable, the stench of which loft were abominable and indescribable. It is to be hoped that this exposure of the dangers to which even "Bumbledom" is exposed by having clothes made in fever-dens will induce that class, at all events, to take steps to have the existing condition of things altered. At the present time the system which obtains is such that no matter where and at what part of London your tailor may reside, be he fashionable or otherwise, you stand a very grave risk of the importation of infection into your family with new garments. SAFETY-VALVE.

OUR correspondent in Milwaukee, Wis., writes: "The river nuisance here is to be considered by a grand jury. The city authorities and others who will be indicted will be prosecuted unless the nuisance is abated within a given time. In some places the filth and slush lies in the bottom of the river to the depth of six feet. The soap factories and distilleries seem to allow the vilest refuse go into the river. Unless something is done to stop the stuff from going into the river a great deal of sickness and death will result from the present bad system of using the river as an open sewer. It would take the Falls of Niagara to cleanse the stream, so that the idea of pumping water into the river through a tunnel from the lake would seem to be a useless expenditure of time and money. The intercepting-sewers will be the only way to remedy the existing evil."

OUR SPECIAL ILLUSTRATION.

RESIDENCES AT NEWPORT, R. I., AND ST. LOUIS, MO.—
PEABODY & STEARNS, ARCHITECTS.

THE upper view of our special illustration this week shows the house of Arthur P. Emmons, Esq., at Newport, R. I. This house is partly red brick and partly frame, with unpainted shingles. The interior is elaborately finished in hard wood. The hall and staircase and the dining-room are of oak. The parlor is of pine painted white.

The other house is the residence of Dr. George A. Bronson, at St. Louis, Mo. The house is of brick, with trimmings of Springfield (Mass.) brown stone. The roof is of red slate.

The architects of both buildings are Messrs. Peabody & Stearns, of Boston, Mass.

OUR ILLUSTRATION OF A MODERATE-COST HOUSE.

A COTTAGE AT LONGWOOD, MASS.—W. WHITNEY LEWIS,
ARCHITECT.

THIS house is the residence of Mr. George R. Wales, on Carlton Street, Longwood, Mass., and is built on the opposite side of the lot on which stands the residence of Mr. John Wales, of which we published a view in our issue of May 13.

The house is built of culled common red brick in first story, with hollow walls. The second story is framed and covered with shingles, and there is rough-cast plaster-work in the gable.

The interior is finished with hardwood floors and dados four feet high in first story, and there is a library in the second story finished in oak. The other rooms have simple whitewood finish. There are three chambers and a library in the second story, and two chambers and a billiard-room on the third floor. The house is planned so as to give all principal rooms a south-west exposure. The cost, including furnace, finish, plumbing, electric-bells, electric gas-lighting, stained-glass, etc., was in round numbers about \$8,000.

The architect is Mr. W. Whitney Lewis, of Boston.

FIRE-PROOF CONSTRUCTION.

BY F. COLLINGWOOD, M. A. S. C. E., AND M. INST. C. E.

No. VI.

(Continued from Vol. XIII., page 56a.)

ISOLATION AND RESTRICTION OF AREA.

THESE principles having been clearly enunciated, their application must be left to each case as it arises. In large mercantile or manufacturing establishments, for example, it may be impracticable to have vertical partition-walls in the several stories. These may be largely isolated, however, by having floors continuous and walls without enclosed spaces, and, as far as possible, incombustible or slow-burning stairs built of non-combustible materials, surrounded by brick walls, with a cut-off door at each story in the stairway and to the story itself; all combustible material banished from elevators and elevator-wells, and the wells tightly enclosed so that smoke cannot pass into or from them, at least until a conflagration has gained considerable headway. Until the heat becomes excessive, even heavy glass is sufficient to prevent the passage of currents of air with smoke and gases from a fire. In some cases automatic hatchways can be introduced in elevators as an additional protection.

That this principle is not sufficiently understood was made evident in a very costly way at a recent fire in New York. A well-built brick building, seven stories high, was fully occupied by a large clothing-house. The floors of the building were made up of heavy wood girders, about 10x16 inches (resting on brick piers in the sub-cellar), with wooden floor-beams, 3x16 inches, mortised in. To the under side of these a wire netting was nailed and mortar applied to the thickness of about an inch (see Fig. 3). At three inches below the top of the beams wooden strips were nailed on, and 1½-inch boarding placed on these. Strips one inch square were nailed on the top of the beams, and the spaces between the beams and on top of the boarding filled flush with concrete. Then the ordinary flooring was laid down. There were several ventilating-flues passing from the sub-cellar up to the top of the building, and opening horizontally through the parapet walls instead of vertically through the coping. Steam-pipes were carried

through several of these which assisted in causing a circulation of air. At each story were openings to this flue for ventilation. A fire broke out in the sub-cellar among packing-boxes and other inflammable material, and it resisted the efforts of the firemen for three hours after its discovery before it was extinguished. It was then found that but little damage had been done to the building. The wire netting had fallen at the hottest point, and the beams were charred where exposed, but were still fit for duty, and the concrete prevented the fire from attacking the floor above.

The greatest damage from smoke occurred in the seventh story, but there was considerable in the fifth and sixth. The smoke had poured in through the ventilators, which happened to be open, and caused a damage to goods afterward appraised at \$165,000, being in the upper story almost a total loss. It was thought that the horizontal openings at the upper ends of the flues were a contributory cause by allowing the wind to prevent a free exit to the smoke. In the remaining stories the damage was very small. Here is a case where the stairs and the elevator-shaft were not at fault, but simple ventilating-flues caused a heavy loss by the wind driving the smoke from them into the rooms.

A case of an entirely different nature was that of the floor of the Allegheny Suspension Bridge, at Pittsburg. This consisted of a wearing-surface of 4-inch oak plank, running lengthwise of the bridge, resting on 2-inch pine planks, which were nailed to longitudinal pine stringers, 4'x17", spaced about twenty inches apart, these finally resting on the iron floor-beams. The floor was thus open underneath, and, as a result of the construction described, there was a series of longitudinal troughs reaching from pier to pier (about 340 feet), and at about thirty-eight feet above the water. By some means (probably a spark from a passing steamboat) the floor caught fire underneath, and, before it could be extinguished, a considerable portion of the span was destroyed. The hollow spaces served as flues and carried

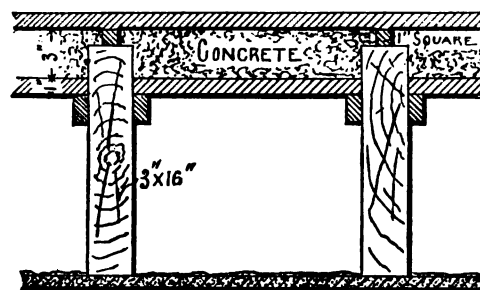


FIG. 3

the fire in both directions with great rapidity. In repairing it, galvanized-iron cut-offs were placed across the spaces at frequent intervals to prevent such action in future.

Wherever in a building partitions are allowable they should be made of sufficient thickness to resist the passage of the heat liable to be caused by a conflagration in any one of the spaces enclosed. As we have seen, four inches of terra-cotta are sufficient for this in most cases. Probably four inches of cement, plaster, or hollow brick will also be sufficient. Even two inches of such material will resist fire for a long time.

Mr. Atkinson's advice to mill-owners is quite to the point here. He says: "It is essential to safety from fire that there be no furrings, no concealed spaces, no place where fire can spread unseen and out of reach of water" (the rest of the quotation has a more restricted application), "no closet, no cupboard, and no place where oily waste or rubbish may accumulate, causing danger of spontaneous combustion. Every place * * * must be visible and every corner kept clean."

The principle of isolation has been carried in mill work to the exclusion of openings through the floors for belts. These are now carried up in a separate chamber cut off from the main rooms by fire-walls. Where this has not been done, as in old factories, etc., belt-boxes may be made to partly accomplish the same purpose.

It is very commonly said of the recent apartment-houses of five to twelve stories high, that they are fire-proof and perfectly safe. Admitting that a fire catching in any one compartment will not be likely to spread beyond it—which in many of them is far from the truth—in numerous cases there is to the occupants an ever-present danger of suffocation, from the fact that the stories are not isolated, and though a person's goods may be in a measure safe, his life may be in the greatest danger. It would seem to be a self-

evident proposition that if this danger cannot be removed, the buildings are unfit for the uses to which they are applied, as their extreme height makes the saving of life by ladders and such extraordinary means largely impracticable.

That the danger from suffocation is not exaggerated is exemplified by a fire occurring in First Avenue, New York, last year. Fire caught on the first floor in a five story brick building; it rapidly extended up the stairway, and also burned the wooden floors of the rear fire-escapes. The damage done to the building was trifling, but before the arrival of the firemen eight lives were lost, mostly by suffocation.

An inspector, whose position requires him to examine all new buildings for rating as fire risks, says he considers that very few of the high buildings of recent construction are such as he would feel safe in occupying.

A case of flagrant disregard of the principle of isolation was brought prominently to the notice of insurance companies by a very expensive fire which occurred a number of years since in what is known as the "Cloth District" in New York. In this case there was a number of well-constructed buildings, with iron fronts, but the iron-work, as is very frequently the case, was of rectangular section and left hollow, the brick-work of the division-walls coming up flush with the rear face of the iron, or with but little lap.

The fire soon crumbled out some of the mortar of the joints, passed around the end of the wall, and caught in the next store; it also passed up through the iron-work as flues from story to story, and the result was the destruction of several buildings and a large amount of valuable goods.

As a comment on this and like occurrences, Chief Shaw, of the New York Fire Department, agrees with Mr. Atkinson in saying that *all* such spaces, as well as floors and walls, should be filled solid.

In reference to the general subject of isolation, or "dividing the risk," as he calls it, Chief Shaw, of the London Fire Brigade, in his pamphlet on "Fires in Theatres," takes very strong grounds. He advocates, first, two great divisions of the building—the part before, and that behind the curtain. The first should be divided into the auditorium, refreshment-rooms, and places for exit and entrance, and the second into the stage, the dressing-rooms, the workshops, and the store-rooms. All of these should be entirely distinct and separate from the portion occupied by the audience. The dressing-rooms, etc., should never be under the auditorium. The divisions to be made by substantial walls with fire-proof doors. The curtain to be of iron, worked with chains or ropes of iron. He says: "The two objects to be attained are these: First, to save the *audience*; secondly, to save the *property*; and these objects will be best accomplished by subdividing both audience and building into as many separate risks as possible, and so arranging the general stowage of the contents as to prevent that sudden blazing up which has hitherto constituted the special danger of theatres."

He gives a record of 112 theatres which had been burned up to the year 1876, showing how notorious has been the neglect of all correct principles in their construction, and adds: "It is possible to insure the *absolute* safety of an audience, and the partial safety of a building and property in case of fire."

The sudden blazing up he refers to is undoubtedly the principal cause of the panics that always occur at fires of this character, and which are the chief cause of the great loss of life.

(TO BE CONTINUED.)

THE MANCHESTER SHIP-CANAL.

AFTER repeated defeats this project has at last received the endorsement of Parliament, and will doubtless soon be in process of construction. The expense to the Canal Company of getting the consent of Parliament was about \$730,000, and the total cost to all parties in interest has been about \$1,750,000—so keen has been the fight. It will be so constructed that large vessels can pass the entrance-locks at almost any state of the tide, and will be able to navigate the canal with ease at a speed of five miles per hour, as the canal will be 35 miles long, 26 feet deep, and 100 feet wide at bottom. There will be four sets of locks to overcome an elevation of 60 feet 6 inches, and the locks will admit the largest vessels afloat. Each set will consist of three locks, one 550x60 feet, one 300x40 feet, and a small lock, 100x20 feet, for coasters and barges. Each can be worked independently by hydraulic power, enabling vessels to be passed up or down in fifteen minutes.

The canal works have been undertaken by responsible contractors at \$28,750,000; the land will cost additional about \$4,000,000, and the purchase of the Mersey and Irwell Canal system \$8,550,000, or a total of over \$40,000,000.

The estimated traffic is, per annum, about 3,000,000 tons (about one-seventh of the total present estimated traffic that might be carried), on which a rate of but one-half of the present tariff, together with the income (\$300,000) from the Bridgewater Canal, with an estimated cost of working (to be deducted) of \$880,000, will pay a dividend of seven per cent., with a large margin for a reserve fund.

The present cost of transferring a ton of goods from ship in Liverpool to railway station in Manchester varies from \$2.35 to \$4.50. The maximum canal charge will range from 68 cents to \$1.94. *Engineering*, from which these statements are taken, remarks: "The railway companies concerned may suffer by competition, but their loss will prove the gain of the greatest manufacturing centre of the country, and a vigorous blow will be struck at the root of one of our greatest commercial evils—excessive carriage tariffs."

In the same number of *Engineering* is a notice of a canal just opened in Russia, at a cost of \$1,500,000, to join the rivers Wyhegra and Kooja, and form a fresh link in the Maryinsky system connecting the rivers Neva and Volga. Its length is fifteen miles, and it has already relieved the pressure of traffic on the other canals. "It is noteworthy that in spite of the development of the railway system in Russia the traffic on the canals shows no signs of diminution."

"Barges on Russian rivers and canals range from 100 feet to 300 feet in length, and carry consequently as large cargoes as many an ocean steamer." "Thanks to the wide-reaching ramifications of the River Volga, the largest in Europe, barges of 500 to 1,000 tons can start in spring with the floods from some tiny stream in the Ural Mountains and arrive in the autumn on the river Neva." "Steamers also can make their way from the Neva, to the Volga and into the Caspian." "This canal system thus possesses an importance which no English canal could claim, although we think that the water-carriage in this country deserves to be rescued from its present neglected and decaying condition into which it has lapsed through the instrumentality of ambitious and over-grasping railways."

We would commend these remarks to our legislators and to those members of our city press who think there can no good thing come out of a river and harbor bill. If the money can be spent in the *right place* there is no more effective weapon against railway monopoly than well-constructed canals or improved river navigation.

UNDERGROUND RAILWAYS.

No. VI.

(Continued from page 153.)

ONE CAUSE OF THE LACK OF FINANCIAL SUCCESS OF THE LONDON ROADS.

ALL persons who have observed the working of the underground roads in London know that over certain portions the trains are comparatively infrequent. An article in the *Engineer* of June 2 explains the reason for this, and as it contains a warning for all managers of roads similarly circumstanced, we give the main facts as stated.

The dominant idea in originating the so-called Inner Circle line was that "it should abut upon, if it did not actually join, nearly all the principal railway termini in the metropolis, commencing with the Metropolitan Railway from Finsbury Circus at one end, and in a westerly and southerly direction from Paddington at the other, and connecting the extremities of those lines by a line on the north side of the Thames."

Now while the engineering features of the route have been practically retained, the working of the route has come to be such as practically to cause the north portion in the hands of the Metropolitan Company and the south portion in the hands of the District Company to be little more than junction lines, with intermediate stations between the various suburban railways lying east and west of the metropolis, thus destroying in great measure their utility as a means of rapid transit. This has been brought about by the acceptance of financial aid from, and the making of traffic agreements with, the various railway companies. The first of these was made by the Metropolitan Company with the Great Western, by which a junction was formed at Bishopsgate, and the trains of the latter admitted over

the lines of the former. The Great Northern next made a similar junction at King's Cross.

Although separate lines were afterward built for a portion of the traffic of the Great Western, unfortunately the authorities were unable wholly to undo their errors, and one consequence of the before-mentioned agreement with the Great Western Company is to be seen in the spur line at the Moorgate Street station for the accommodation of the Great Western main line trains. On the exit of each train from this spur, both the up and down lines are blocked, and the working of the Circle trains is liable to be hindered, in addition to the usual risks of accidents at junctions; while, moreover, every train that is run into or out of the spur blocks out a train which might otherwise, and with greater public convenience, be run round the entire Circle. The same remarks apply to the spur lines at each side of the Aldgate station, into and out of which five or six trains per hour are run, and where, on the exit of a train from the one spur and the entrance of a train to the other, both lines of the Inner Circle are blocked and trains displaced that might otherwise be run round the entire Circle. These, with the present Circle trains, would give a 5-minute service at the eastern and western sections, in place of the 10-minute service as at present, without increasing in any way the number of trains now run on the northern and southern sections.

Similarly the District Company formed junctions with the West London Junction and other railway companies in that district. So vigorously was the foreign or suburban traffic developed that several years before the Inner Circle was completed the suburban trains running over the District portion of the Circle had reached ten per hour, as against only six per hour on the Circle lines, giving, with the latter trains included, a 3¼-minute service between Gloucester Road and the city as against a modest 10-minute service on the Circle lines. A similar state of things had by this time come into being on the section owned by the Metropolitan Company.

The net result of these and later fatal departures from the original plan of a circle traversed at frequent intervals by its own trains has been, that while there is a 3¼-minute service of trains between Gloucester Road and the Mansion House, and a 5-minute service between the Mansion House and Mark Lane on the District section, and a 4¼-minute service between Edgware Road and Bishopsgate, and a 5-minute service between Bishopsgate and Aldgate on the Metropolitan section, which render those portions of the Inner Circle of eminent service even in competition with the expeditious and inexpensive omnibus services in those districts, there is to this day merely a 10-minute service between Edgware Road and Gloucester Road, on the western portion, and between Mark Lane and Aldgate, on the eastern portion of the Circle, which, as has already been pointed out, is quite inadequate for the purpose. That this is admitted is evident from the fact—if mere observation and experience, open to all, were not sufficient to establish it—that, on the completion of the Inner Circle, a 7½-minute service was inaugurated, but unfortunately had to be abandoned in consequence of the impossibility of conducting it with the requisite regularity in conjunction with the requirements and complications of the through and foreign traffic between the eastern and western suburbs.

The 10-minute service on the western portion of the Circle is further lessened in value by the delays incidental to the changing of the engines and the replenishing of the water-tanks reserved for that portion of the line. No sooner has a passenger—after waiting perhaps eight or nine minutes—taken his seat in a train at High Street, Kensington, say, on his way to catch a main line train at Victoria Station—a 12-minute journey only, barring delays—or at Charing Cross, or, perchance, to keep an important engagement, that he finds himself further delayed by an interchange of engines. Similarly passengers at South Kensington going to Paddington, or some intermediate station, have, after waiting, it may be, equally long, to undergo a like delay by the interchange of engines. Who is there that does not carefully avoid the line of omnibuses—the instances of which are fortunately few and far between—the vehicles of which are deliberately stopped in the middle of the journey on one's way to catch a train, to change horses on the route? If the service on the western section were a 3 or 4-minute one, as at other portions of the Circle, the delay in changing engines would be less seriously felt; but when it is added to a 10-minute interval, it may make all the difference between catching or losing a main line train.

The first obvious and important lesson to be learned from the experience of the Inner Circle Railway of London is, as has been already noted, that the successful working of a circular system in a densely populated urban district, where the trains must necessarily be very frequent, is incompatible with junction lines carrying through trains on one and the same set of rails. Of course the proper plan, so far as the Inner Circle working is concerned, would have been to have had no junctions or spur lines at all, and to have run all trains around the eastern curve. Secondly, the proper way of dealing with the passenger traffic from foreign or suburban lines is to "exchange" it at the junction, as is done, and has been done for years, at the Baker Street station with the traffic of the St. John's Wood Railway, the results of which, notwithstanding the exchange mode of working, have apparently been so satisfactory to the railway authorities as to lead to the line being extended almost to the dimensions of a trunk line. With a Circle system of working, pure and simple, a 2½-minute service could be maintained with ease and perfect regularity in both directions. A service such as that would carry off with rapidity, and with even shorter trains than at present, the exchange traffic, with less delay to passengers than frequently happens with the present system of through trains and junction lines.

This experience is valuable as showing that it is not well in the management of great public enterprises to be too impatient for results; but, having carefully prepared a scheme, allow a reasonable time for its development before entering upon changes which may prove hurtful and even prevent its ultimate success. The promoters of similar roads here may draw comfort from this statement, since one of the standing objections to investing in them has been that the London roads were not paying.

We now learn, at least, one reason why this has been the case. We can well imagine that if we had to wait systematically for 4¼ to 10 minutes for trains on the elevated roads, with the chance of delays in addition, we would in many cases not patronize them, and they *certainly* would not pay.

STEAM-BOILER EXPLOSION.

A CORRESPONDENT, writing to us from London in regard to a boiler which exploded at Stepney some time since, under grossly careless circumstances, says:

"The jury brought in a verdict of 'accidental death,' at the same time stating that the boiler exploded by being too thin, and not having been tested by hydraulic pressure, and that the proprietor of the same was much to blame. The said proprietor, in his evidence, admitted that he had, for some thirteen years, practiced as an engineer, but he could not see anything wrong with this boiler, although he knew, when he purchased it, that it was fourteen or fifteen years old. Further, the crown-plate of the furnace had been down twice, and, at the time of the explosion, was actually down to the extent of two feet in length and two inches in depth, having been in that condition for the last eight months. Independent expert evidence brought out that the shell was originally three-eighths of an inch thick, but was worn down to such an extent that daylight was almost visible through it, and at the point of fracture varied from a knife-edge to one-quarter of an inch. Given, therefore, a boiler worn to this extent, possessing no reliable safety-valve, but having half cwt., very frequently, hung upon those with which it was furnished, possessing, moreover, a defective water-supply, and no regular attendant, it is difficult to imagine a case of ignorance more crass and indifference more culpable than in this instance."

This steam-boiler stood in a bedding manufactory, and was of the ordinary Cornish type, with one cylindrical tube running through it from end to end. The flames, after passing through the furnace-tube, returned through external brick-work flues along the sides of the outer shell to the front end, and then passed under the bottom back again to the chimney. The boiler measured about 12 feet 6 inches in length by 5 feet in diameter in the shell, and 2 feet 7½ inches in the furnace or flue-tube. The shell consisted of four belts of plating, each belt being in three plates, single-riveted, both longitudinally and transversely, while the flat ends, which were secured to the shell by internal rings of angle-iron, were each strengthened by a single central gusset-stay placed vertically over the tube and secured to both shell and ends by means of angle-irons. There was a steam-dome about two feet in diameter by two feet in height fixed on the second belt of plating from the front end. The thickness of the plates in the

cylindrical shell appears to have been originally about three-eighths of an inch, and in the internal flue-tube one-quarter of an inch. The fittings on the boiler included three safety-valves, all of the ordinary lever type; a dial pressure-gauge ranging to 200 pounds; a glass water-gauge; two test-cocks and a blow-off cock. The safety-valves were stated to be loaded to forty pounds per square inch, but the ordinary working-pressure was said to range from twenty-five to thirty-five pounds. It had been bought at second hand.

The boiler gave way in the outer shell at the back end, the last belt of plating being peeled away from the remainder of the boiler, while the third belt of plating was also nearly severed and opened out almost flat. The last belt of plating was shot through the shops, almost demolishing them, and resulting in the death of three men and the injury of many working women and girls. Some scandalous facts are brought out at the inquests. The man Grant, who had charge of the boiler and was one of the killed, had once before the explosion allowed the water to get out of the boiler, causing the burning and bulging of the furnace crown-sheet. For this he had been discharged, but had afterward been taken back. It was shown that it was his practice to go away and leave the boiler in charge of one of the women. The woman used to get up steam, when Grant was away, on her own account. The bad condition of the boiler was notorious about the shop, and its condition had been called to the attention of the owner of the factory. It had corroded away badly near the bottom of the last row of plates, where the primary rent took place, until the plate was unable to stand the ordinary working-pressure, and then it "blew up."

Engineering gives the following excellent summary and warning:

"The facts of the case are extremely simple, and do not admit of question or doubt. The owner bought the boiler second-hand about three years ago, put it down in a damp cellar, dispensed entirely with skilled supervision, and left it to the attention of anybody about the place, the steam being sometimes got up a young girl, who said she 'did not understand the safety-valves,' and 'knew nothing about the water-gauge.' As a natural result of the damp situation, corrosion was set up, and the plates in contact with the brick-work seating were gradually wasted away, and at length became so thin as to be unable to resist the ordinary working-pressure, when the boiler burst, and brought down the greater portion of the premises, crushing two men to death and burying more than twenty other persons in the ruins.

"The cause of the explosion—viz., wasting of the plates by corrosion—was clear beyond dispute. All the experts were agreed on the point, and it was not even questioned by the owner. It is equally clear that the defective condition of the boiler could have been readily ascertained by competent inspection, and the neglect of this precaution under the circumstances of the case amounts in our eyes to a degree of negligence equivalent to crime, for which the censure of a coroner's jury is a most trifling and inadequate punishment.

"When a man lays down in a populous neighborhood such a dangerous instrument as a steam-boiler he is bound to have some regard for the lives and property of his neighbors, and incurs toward them a responsibility which in the event of disaster a plea of ignorance cannot deprive him. It is not right that he should jeopardize the lives of others for his own private gain. Nor has he a right to call upon others to run a risk which he may be prepared to incur himself. The bargain is one-sided. He reaps all the gains if nothing goes wrong, while others join at the losses if a disaster occurs.

"Boiler explosions, as we have over and over again pointed out in our columns, are not accidents, but can be prevented by the exercise of very simple precautions. The causes to which the majority of them are due are not developed in a day and could be easily detected by timely and efficient inspection. Had this precaution been observed in the present case the explosion, with its attendant loss of life and property, would not have occurred."

ENGLISH PLUMBING PRACTICE.

BY A JOURNEYMAN PLUMBER.

No. LVIII.

(Continued from page 206.)

SOIL-PIPES (CONTINUED).

A FEW illustrations have been given in previous papers of defective arrangements of soil-pipes. The examples

were taken from houses built, some of them about fifty years ago, and others that have been erected within this last three years. They are selected from hundreds of other cases of bad work that could be mentioned, but it is only fair to add that a great deal of a better class is executed, some details of which will be given in future papers.

I should like to diverge from the subject of the heading for a few minutes, to show that it is not always the journeyman plumber who is to blame for bad work. No matter how skillful he may be, he cannot make a good job with bad or improper materials, and, when working to some one else's dictation, it is not fair the plumber should be charged with the dictator's mistakes. Further, the public—that is, those interested in houses as owners or tenants—are very much to blame for a great deal of bad work. As an illustration: In a great number of cases where the writer has been sent for to make an examination of a house, he has been met by the person interested, and it is really ludicrous the pains that are often taken to impress upon him (the writer) that there never has been any illness in the house and there is nothing the matter. In these cases one is almost tempted to ask the person: "Why send for a sanitary man, then?" Novices at making examinations of houses would be influenced by the above class of people, and not thoroughly test the drains, etc., while old hands at it would simply smile and make a thorough examination.

A case occurred a few days ago when the drains of a house were tested with smoke and found very defective, the smoke escaping between the joints of the stone paving in passages and floor-boards of rooms. In spite of this proof the owner was not satisfied until he had called in another adviser, who made a report similar to the first one's. The services of both advisers were dispensed with and a jack-of-all-trades employed to stop up the cracks in the flooring with mortar and putty.

Very often after an examination of a house has been made and the report sent in to the owner, the sanitary man has to submit to all sorts of interrogations, such as "Is it as bad as you say? What will it cost to put right? Are you sure it is defective? How long will it take to do? I don't think it is so bad as you make out! Can it be done without the family leaving the house? You must have made a mistake, as no one has been ill! Could not the holes be stopped with putty?" After about an hour, and sometimes two, of this misery, when one wishes he had never had been called in, he is dismissed with the remark, "I will think about it and let you know." This promise is very often not kept, but some talented expert, who can do wonders with paint and putty, is called in, with the result that very often the doctor's bill is considerably more than would have paid for that which would have prevented the illness of the family. But to return to our original subject. In several cases of testing smoke has been found to escape beneath the seat of an upstairs water-closet, and this sometimes when trying to find cause for smells in some other position. In taking down the wood enclosure of the water-closet it is often found that a small trap is placed beneath the lead safe to take away any water that overflowed the basin, the outgo of the trap being branched into that from the water-closet trap. The water has become syphoned out of the small trap, as the soil-pipes were not ventilated, and the small pipe, called the "weeping-pipe," which is arranged so as to recharge this trap with water at each usage of the water-closet, has become choked, so that no water can pass through to recharge the trap. Figure 1 is a plan of the two traps and soil-pipe, and Fig. 2 is an elevation on A B showing the apparatus fixed and the weeping-pipe at C. In these cases the water-closets are generally flushed by means of valves and service-boxes fixed in the cisterns over. In other cases, where a valve and regulator flushing-apparatus has been used, the weeping-pipe has been branched into the pipe between the valve and arm of the basin.

Twenty to twenty-six years ago the writer assisted to fix large numbers of water-closet traps in the manner above described. At that time it was considered to be first-class work and was done in all high-class houses. One case comes back to memory where the traps for a range of eight water-closets were arranged as shown on plan, Fig. 3. I can remember quite well the pains taken by the plumbers to shave and make all the joints to correspond, and if one looked a little different to the others it was made again. So much value was not attached to ventilation-pipes at that time as now, ¾-inch and 1-inch pipes being considered quite large enough for the purpose of preventing syphonage of traps. In some cases the D-traps were made very large—that is, ten inches or eleven inches deep

instead of nine inches, which was the usual size, and seven inches wide, the dip-pipe being kept a little distance from the heel, as shown in section, Fig. 4. By doing this space is made for a larger quantity of air to enter, with less displacement of water than is the case with a small size D-trap, in which the heel and sides are close to the dip-pipe. But traps of that size have now fallen into disuse, being often described as small cesspools, as they hold so much filth. Large soil-pipes were also in much favor, as it was more difficult to fill them with water so as to start a syphonic action on the water in the traps. These precautions were taken in the case of the work shown in Fig. 3, which, no doubt, was a thorough success when judged with the experiences of that age, but it was also found necessary to fix $\frac{3}{4}$ -inch flushing-pipes to the water-closets, a larger size with a good head of water often upsetting all calculations on the point of trap-syphonage. In cases similar to Fig. 3, which have been renewed within this last ten years, it has often been found that the safe-traps have been quite empty, partly by syphonage and the rest by evaporation; the weeping-pipes in these cases having become useless by being choked at D, Fig. 5. This is not so likely to occur if the bottom end is left open and other end tapered, as shown by dotted lines at E. Any dirt lodging on the top end of the pipe would be removed by the scour of the water as it passes toward the basin, whereas in the first instance anything getting into the end D would become further jammed by the water-pressure above it. In the

with a hinged flap on the end to prevent any inward draught and to keep out birds, etc. In some instances it is very difficult to do this. The writer once had a job where it was literally impossible, unless a hole was drilled through a large square of plate-glass, or going to a large expense which was far in excess of the value of the object sought. In this case the lead safe was continued so as to entirely cover the floor of the water-closet. The wooden enclosure was left one inch clear of the floor, so that should any leakage occur to the apparatus the water would run on to the floor in such a way that it must be seen by the attendant, who would at once send for the plumber to put the defect right.

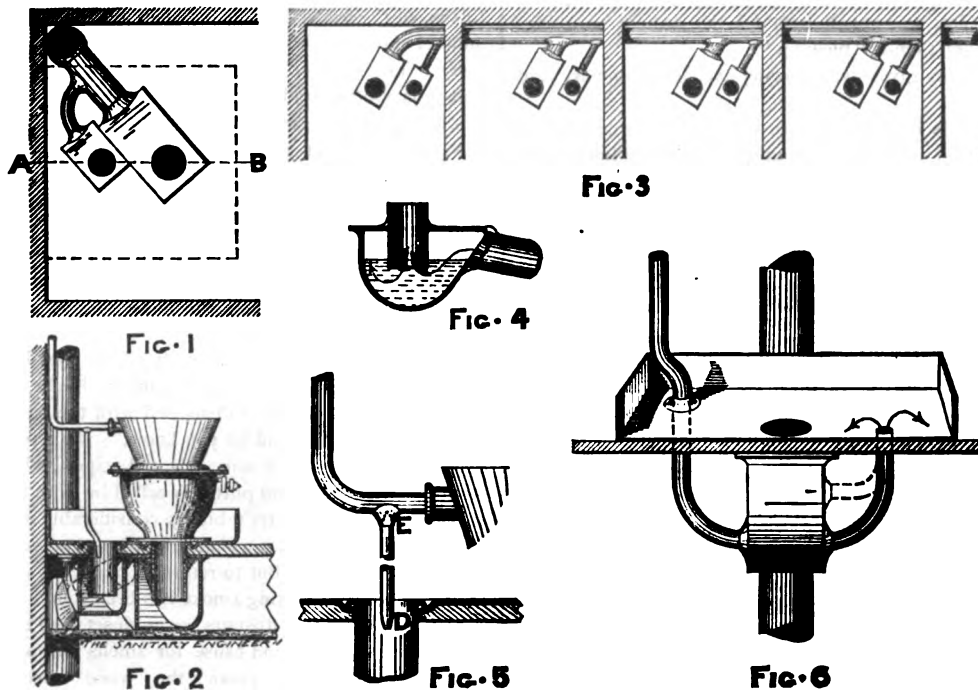
(TO BE CONTINUED.)

Correspondence.

GARBAGE FURNACES.

OFFICE OF BOARD OF HEALTH,
GRAND RAPIDS, MICH., August 14, 1886.

SIR: Is there any economical garbage and refuse burner that you can recommend? Can I get any cuts, or more detailed description of the one mentioned in your paper just received? This board contemplates the adoption of a refuse and garbage burner, if one satisfactorily presents itself in all respects. Any suggestions that occur to you that you would consider of advantage to this board would be duly appreciated. I remain, respectfully yours, etc.,
H. N. CARGILL, Secretary Board of Health.



case of a stoppage in the soil-pipe, the safe-trap becomes perfectly useless. The outgo being branched into the soil-pipe, any stoppage in the soil-pipe affects this trap as much as that under the water-closet.

In some cases the waste-pipe from the safe has been branched into the cheek of the water-closet D-trap, as shown at Fig. 6. So long as the water is in the trap to the necessary height no smells can escape from the soil-pipe. But the waste-pipe is a serious evil in another way. Little puffs of air are driven out, as shown by the arrow, each time the water-closet is used, and sewage-matter is also driven out and lays in the bottom of the safe to an extent often injurious to health. There are several cases on record where this safe-waste pipe has been branched into the trap above the water-line, as shown by dotted lines, and others where it has been branched into the soil-pipe and no provision whatever made for keeping smells from escaping. On the left hand of Fig. 6 is shown a fragment of the cistern-waste branched into the water-closet D-trap. Several years ago this was considered the right thing to do, and the writer has done them that way. When newly fixed, as shown, it is highly dangerous to pull out the cistern stand, or cleaning out pipe, as the water will rush down the waste-pipe through the trap and play up as a fountain through the safe-waste pipe. After being fixed for a few years the ends of the pipes in the traps become furred up so that no water whatever will pass, thus rendering these pipes perfectly useless for their purpose. Most sanitarians carry the waste-pipe from the safe out of doors into the open air,

[The garbage furnace mentioned in our issue of August 12 is Fryer's. Our correspondent will find quite full description, with illustrations, of this apparatus in our issues of March 1, 1881, and September 7, 1882. A furnace manufactured by the United States Sanitary and Fertilizer Company, 29 Pemberton Square, Boston, is described in THE SANITARY ENGINEER of January 22, 1885. The "Beehive" destructor, designed by John Edward Stafford, Borough Engineer of Burnley, England, is illustrated in the issues of February 19, 1885, and December 31, 1885, and a destructor made by Lieutenant H. I. Reilly, U. S. A., for the U. S. Post at Governor's Island, N. Y. H., is shown in the issue of August 13, 1885.]

WHEELING, W. VA., August 21, 1886.

SIR: There is in process of construction, under the supervision of the Health Department of Wheeling, W. Va., a crematory for the destruction of garbage, night-soil, and offal of all kinds. It will have capacity for destruction of sixty barrels of night-soil per hour, with natural-gas for fuel, and will be the first erected anywhere for the purpose on such a large scale. It is expected to do the work thoroughly and economically. Respectfully yours,
GEORGE I. GARRISON, M. D., Health Officer.

NOTES FROM PHILADELPHIA.

(From our Regular Correspondent.)

PHILADELPHIA, August 20, 1886.

THE present is a time of wonderful activity among the plumbers of the city. More work is said to be doing now

than has been known for very many years. Many of the masters are much in need of journeymen, and their efforts to secure good workmen have been futile. Several have resorted to advertising in the daily papers, and yet there are but few applicants.

Much activity is also displayed in the building business. A vast number of buildings are now under course of erection and nearing completion.

Plans have been prepared for the erection of the new Baltimore and Ohio Railroad Depot, at Twenty-fourth and Chestnut Streets, in this city, and the specifications indicate that it is to be one of the finest in the United States, both in point of architectural beauty and in facilities for transacting the business of the road. The building will have a front of 173 feet on Chestnut Street, and of 110 feet on Twenty-fourth Street, and the main portion of the building will be 67 feet high, rising from the pavement of the Chestnut Street Bridge, which will adjoin the new station. In outward appearance the style of architecture will be Flemish. The lower walls of the building will be iron, carried on iron columns and boxes, and the upper walls will be of brick, red stone, and terra-cotta. The string courses, cornices, and brackets will be of terra-cotta, while the roof will be of red tile. The interior of the building will be furnished in the most elegant style. Passengers to trains will enter on the second floor and descend by means of elevators and stairways to the station. The main waiting-room will be 119 by 38 feet, and the adjoining ladies' waiting-room will be 48 by 63 feet. On the same floor with the waiting-rooms are the restaurant and the lunch-bar. The ceiling of this room will be twenty feet high, ornamented with iron girders forming panels in the ceiling. The walls will be of tile, with high wainscoting running around the room. The third and fourth floors of the building will be occupied by the officers of the company and the employees, and arrangements will also be perfected for the accommodation of about 100 telegraph operators. Work on the building is now soon to be commenced, and it will be pushed with all speed, and it is expected that the foundation will be laid in the early part of the fall.

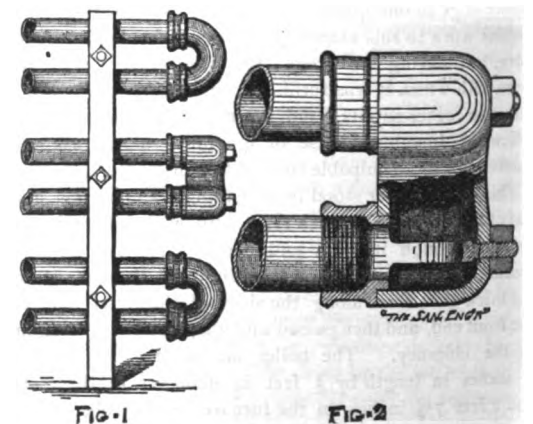
Work on the new railroad is being pushed as rapidly as possible, the road being almost ready for travel to the tunnel, and even portions of the erection of the tunnel are completed, but much labor yet remains before trains can be run any further than to the depot at Chestnut Street. The company is now receiving freight at different portions of the city and transferring it to points where they can load and ship over the completed portions of the road.

Novelties.

NEW FITTING FOR STEAM, ETC.

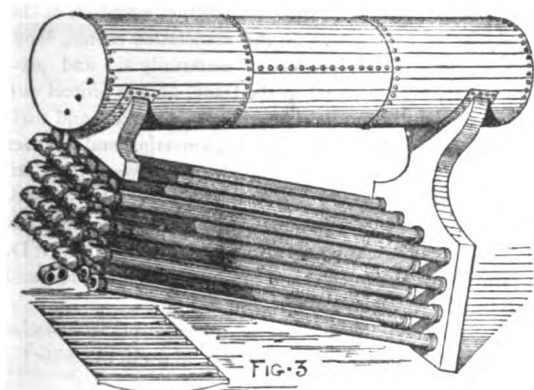
THE accompanying figures show a new fitting for steam or hot-water work, the invention of Mr. O. J. McGann, of 601 Grant Street, Pittsburg, Pa.

It is principally intended as a "repair" fitting for coils, but may be used in the manufacture of return-bend radiators, or as a boiler fitting in the construction of water-tube



boilers, when the pipes do not exceed (say) $1\frac{1}{2}$ inches in diameter, such as might be used for house-heating boilers. Figure 1 shows its application as a repair-fitting to a box-coil or a flat coil. Its application to a radiator is easily understood by the same figure. Figure 2 shows it in detail with one side broken away, and Fig. 3 shows its application to an ordinary form of water-tube boiler.

As will be seen it is composed of three pieces. Two thimbles, with threaded tail-piece and nuts to screw on the



ends of the pipes, and a cross-coupling piece which fits on the same, the joint being packed with a washer made of a composition of rubber and soft metal.

Its use in the repairs of a frozen coil must be apparent to any one who has attempted to "screw up" right and left hand pieces in the middle of the box-coil.

HEALTH OF THE UNITED STATES ARMY FOR THE MONTH OF FEBRUARY, 1886.

THE following is an abstract from the monthly sick returns of the medical officers of the army, condensed from returns furnished to THE SANITARY ENGINEER by the Surgeon-General of the Army:

During the month of February, 1886, in eight military departments, embracing 142 military posts and arsenals and 23 commands operating in the field from which reports were received, there was returned a total mean strength of 24,800 officers and enlisted men.

There were admitted to sick report 2,229 cases of disease and injury, or only 90 per 1,000 of mean strength.*

This is a decrease of 17 per 1,000 below that for February, 1885, and 52 per 1,000 below the average monthly rate for the ten years, which was 142 per 1,000 of strength.

The average rate for February (as deduced from data for the ten Februaries of the decade) was 127 per 1,000 of strength.

Fifteen deaths occurred, as against 24 for the previous month and 13 for the previous February. This represents an annual mortality from all causes of 7.3 per 1,000, or 5.4 per 1,000 less than the average for the preceding decade, which was 12.7 per 1,000 of mean strength.

The number of discharges for disability was 46†, representing an annual loss to the army from this cause of 22 per 1,000 of strength.

The number of troops constantly non-effective from sickness was 936, or 38 per 1,000 of strength, being 1 per 1,000 less than the rate for last month. The rate for the previous February was 46 per 1,000, and for the previous decade 44 per 1,000 of strength.

The rate of recoveries to the whole number under treatment was 683 per 1,000; the rate of deaths, 5 per 1,000.

The average duration of treatment among patients who recovered was 10 days, and among those who died 25 days.

The causes of deaths were as follows: Pneumonia, 3; valvular disease of the heart, 2; phthisis pulmonalis, 1; enteric fever, 1; Bright's disease, 1; diabetes mellitus, 1; chronic diarrhoea, 1; abscess of brain, 1; pyæmia, following gangrene from frost-bite, 1; hanging (suicidal), 1; acute toxic diarrhoea (imbibed some irritant poison while drinking), 1; poisoning by morphia (accidental), 1.

The causes of admission, and those which have chiefly served to impair the health of the army during the month of February, are shown in Table I.

Among the more important diseases under treatment during the month of February—those remaining sick from the previous month being included—there were 9 cases of enteric fever, 1 new case being reported; 19 cases of pneumonia, 5 of which were new admissions; and 22 cases of pulmonary phthisis, of which 4 were admitted this month. This is a decrease of 3 cases of

enteric fever, and 3 of pneumonia, from the whole number under treatment in January, and the same number of cases of pulmonary phthisis.

The ratio of mortality from enteric fever to cases treated was 11.1 per cent.; from pneumonia, 15.8; and from pulmonary phthisis, 4.5 per cent.

Of contagious and infectious diseases, there were 8 cases of erysipelas, 1 of varioloid, and 1 of scarlet fever, all newly admitted.

Table I.

Causes of Admission in the Order of their Numerical Importance.	Number of Cases.	Rate per 1,000 for February, 1886.	Average Rate per 1,000 for Ten Previous Februaries.	Increase or Decrease of Rate.
Diseases of the respiratory system	449	18.10	28.60	-10.50
Diseases of the digestive system	353	14.24	7	7
Injuries and accidents	241	13.74	18.66	-4.92
Rheumatism	158	6.37	10.40	-4.03
Diseases of the nervous system	155	6.25	8.95	-2.70
Diarrhoeal diseases	132	5.32	10.26	-4.94
Veneral diseases	122	4.92	7.11	-2.19
Malarial fever and resulting conditions	105	4.23	9.31	-5.08
Enteric fever	9	.04	.16	-.12
Typho-malarial fever	1	.04	.05	-.01

A comparison of the health of the several military departments may be seen in Table II.

Table II.

DEPARTMENT OF	Admission-Rate per 1,000 of mean strength.	Number of Troops per 1,000 of mean strength constantly non-effective from sickness.	Average number of days treated among patients who recovered.	Rate per 1,000 of deaths to number of cases treated.
Platte	114	40	7	..
Missouri	110	43	9	..
East	99	41	10	0.9
Texas	97	45	11	4.4
Dakota	84	36	11	5.5
Arizona	60	32	10	7
California	58	32	19	..
Columbia	51	28	11	7
The entire army for the month	90	38	10	5
The entire army for the preceding decade, monthly average	142	44	7	7.5

Eighteen posts have shown admission-rates for the month which were greater than the normal of 142 per 1,000 of mean strength, and 124 less.

In the Department of the Platte, 25 per cent. of the posts gave admission-rates above the normal; in the Department of the Missouri, 20 per cent.; in the Department of California, 17 per cent.; in the Department of the East and of Texas, each 15 per cent., and in the Department of Dakota, 10 per cent. None of the posts in the Departments of Arizona or of Columbia had rates of admission that were above the normal.

The posts showing the highest rates were: Fort McKinney, Wyo. T., 378 per 1,000 of strength; Indianapolis Arsenal, Ind., 333; Fort Myer, Va., 259; Jefferson Barracks, Mo., 233; Watervliet Arsenal, N. Y., 206.

The lowest admission-rates were at Plattsburg, Barracks, N. Y., 0; San Carlos, Ariz., 0; Fort Cummings, N. M., 0; Fort Mason, Cal., 0; Angel Island, Cal., 0; Benicia Barracks, Cal., 0; Fort Stockton, Tex., 14; and Fort Elliott, Tex., 15 per 1,000 of mean strength.

Forty-three posts have shown rates of constant non-effectiveness from sickness above the normal of 44 per 1,000 of mean strength, and 96 below.

The posts showing the highest constant rates were: San Diego Barracks, Cal., 286 per 1,000 of strength; Jefferson Barracks, Mo., 96; Fort McKinney, Wyo. T., 91; Camp Poplar River, Mont., 81; Fort Randall, Dak., 76; Fort Wingate, N. M., 73. While the lowest rates were: San Carlos, Ariz., 0; Fort Mason, Cal., 0; Angel Island, Cal., 0; Fort Cummings, N. M., 1; Fort McDermit, Nev., 2; Benicia Arsenal, Cal., 2; Fort Niagara, N. Y., and Fort McDowell, Ariz., each 8 per 1,000 of mean strength.

At stations showing high admission-rates, catarrhs, rheumatism, diseases of the digestive system, malarial fever, and diarrhoea have prevailed.

The causes producing high constant rates were: Pulmonary phthisis, pneumonia, catarrh, tonsillitis, and injuries.

During the month of February enteric fever was reported from 7 stations. The only new admission for this disease during the month occurred at Fort Keogh, Mont., terminating fatally in ten days. Pneumonia existed at 17 stations, as against 19 for January, and 16 for December. The cases newly admitted occurred at Fort Wayne, Mich., 1, with fatal termination in four days; Fort Bowie, Ariz., 1, with fatal result in six days; Fort Hays, Kan., and Fort Bayard, N. M., 1 case each, and another in a field command at Bisbee Canon, Ariz. At Fort McHenry, Md., 1 death was reported in a case remaining from previous month. The average length of treatment in fatal cases was 13 days.

Erysipelas was reported at Fort Totten, Dak., 5 cases; at Columbus Barracks, O., Fort Bayard, N. M., and Fort Lewis, Col., 1 case each.

Varioloid, 1 case, at Fort McIntosh, Tex.

Scarlet fever, 1 case, at Fort Riley, Kan.

The Post-Surgeon at Fort Totten, Dak., states that he endeavored to ascertain the cause of the outbreak of erysipelas at that post but was unable to fix any upon cause. That the hygienic condition of the post was good, and that the men who were attacked, with one exception, were not addicted to the immoderate use of intoxicating liquors, and neither had they undergone any unusual exposure. That the disease also prevailed among the children at the Indian mission and among the Indians residing away from the agency. He further states that he is inclined to believe that the disease was due to some peculiar condition of the atmosphere not known, and perhaps to the cold and damp state of the atmosphere there during the month.

The Post-Surgeon at Fort McIntosh, Tex., in his sanitary report, dated February 6, stated that a case of varioloid occurred at that post on the 18th of January in the person of a soldier who had been revaccinated successfully with bovine lymph on March 12, 1884; also, that a second case appeared later in the person of another soldier of the same company who had also been successfully revaccinated on March 12, 1884.

The Post-Surgeon at Fort Stanton, N. M., reported 5 cases of purulent conjunctivitis during the month, with the following explanation: "The origin of the outbreak of purulent conjunctivitis can only be conjectured. Its apparent limitation to one troop of cavalry does not, I am confident, possess any important significance except to emphasize the influence of accident. I have personally investigated the conditions under which the soldiers of this troop now live with special reference to the occurrence of this disease.

"The altitude of the post is considerable. The atmosphere is rare. The consequent variation of temperature between day and night is great. One is chilled in a few minutes when out about sunset. The post is in a narrow valley—in a tunnel, as it were—at one extremity of which arises, to the height of perpetual snow, a group of mountains—the Sierra Blanca range. After the fall of the year the rains cease in this locality almost altogether. When the sun has heated the atmosphere of the valley each morning a draught from the cold mountain-tops is established, constituting a wind, which is rarely so mild as to be denominated a breeze. It more often blows with the violence of a hurricane. This dries the surface of the earth within its limit as well as things upon the surface. Through the influence of the winds the atmosphere is full of dust and other impurities, mingled with and supported by dust particles. Not enough of moisture is precipitated to cleanse the air. It is known to observing people that rain-water stored in receptacles here will take on putrefaction very promptly. I believe that the atmosphere contains the impurities which it has swept from the ground that confer upon susceptible individuals the purulent conjunctivitis, from which several soldiers have been suffering at this post.

"The circulatory disturbances caused by the direct influence of the cold winds lend assistance. The very large herds of cattle to be seen constantly in this narrow valley deposit upon the ground an immense amount of filth, part of which is taken up into the atmosphere above the surface of the ground by the winds.

"Purulent conjunctivitis is not confined to this post. It is elsewhere in the vicinity. Abscesses are not uncommon. There are reports of an epidemic affection having the na-

* The names and diseases of all officers and enlisted men who are excused from any part of their military duty by reason of disability are required to be entered upon the reports from which these data are drawn.

† Recruits at depots discharged for disability which existed prior to enlistment not included.

ture of scarlatina or diphtheria—it is not known which—the distance of ten or twelve miles. Erysipelas is said to prevail below the post.

"Small-pox is reported both at Tularosa and at Three Rivers."

Reports received from 23 commands operating in the field showed an aggregate mean strength of 2,236 officers and enlisted men.

The prevalent disorders among troops in the field were diarrhoeal diseases, rheumatism, bronchitis, and injuries.

Attached to the army, and living at the different military stations, were 5,126 women and 6,230 children—the wives, children, and servants of the officers and enlisted men.

Among the women were reported 428 cases of sickness during the month, or 83 per 1,000 living. Four deaths occurred, representing an annual death-rate of 9.4 per 1,000 living.

The causes of deaths were reported as follows: Syncope followed by heart clot, 1; dilatation of the heart, 1; valvular disease of heart, 1; consumption, 1.

Among the children, 382, or 61 per 1,000, were taken sick.

Three deaths occurred (all under five years of age), representing an annual death-rate at all ages, of 5.8 per 1,000 living.

The causes of deaths were reported as follows: Failure of heart, 1; tubercular peritonitis, 1; unknown, 1.

Whooping-cough was reported among the children at Fort Keogh, Mont. T., 9 cases; also at Fort Snelling, Minn., and Vancouver Bks., Wash. T.

Measles at St. Augustine, Fla., 6 cases; at San Antonio, Tex., 2 cases; and at Fort Niobrara, Neb., 1 case.

Diphtheria at Benicia Arsenal, Cal., 2 cases; at Watervliet Arsenal, N. Y., 1 case.

Scarlet fever at Fort Riley, Kan., 3 cases.

The prevalent diseases among this class were: Catarrh, bronchitis, common colds, tonsillitis and other diseases of the digestive system.

OBITUARY.

E. S. CHESBROUGH, CIVIL ENGINEER.

ELLIS SYLVESTER CHESBROUGH, Past President of the American Society of Civil Engineers, died at his residence in Chicago on the 18th inst. He was born in Baltimore County, Md., July 6, 1813, and began his professional life as a chainman on the preliminary surveys of the Baltimore and Ohio Railroad.

Having by close attention mastered the elements of railway surveying, he was in 1830 appointed assistant engineer on the Allegheny Portage Railroad, under Col. Stephen H. Long, of the U. S. Topographical Engineers.

The next year he became assistant engineer of the Paterson and Hudson Railroad, afterward the south-eastern division of the Erie Railroad. He located nearly the whole road, and also made preliminary surveys for a line from Newark to Jersey City, N. J.

Captain William Gibbs MacNeill, of the Topographical Engineers, was chief of this work, also of the Boston and Providence until its completion, and of the surveys for the Taunton and New Bedford, and Mr. Chesbrough was engaged on them under him from 1831 to 1836.

In 1836 Mr. Chesbrough was appointed resident engineer of the proposed line from Lowell, Mass., to Concord, N. H., under Mr. George Whistler. From 1837 to 1842 he was under Major MacNeill as Senior Assistant on surveys and construction of the Louisville, Cincinnati, and Charleston R. R., being placed in command of the afterward prominent engineers, J. P. Kirkwood, Alfred W. Craven, Gen. G. S. Greene, and Gen. J. C. Fremont.

Being thrown out of employment by the financial depression of 1836, he went into the shops of the Providence and Stonington R. R. to become familiar with the use of tools. He also tried farming, but unsuccessfully.

In 1844 he located and constructed the Stoughton branch of the Boston and Providence R. R. He also located a line between Ashburnham, Mass., and Brattleboro, Vt., and entered upon the construction of the Pawtucket branch of Boston and Providence R. R. While engaged on this he was invited to become chief engineer of the Western Division of the Boston Water-Works.

As this was a branch of engineering he had not paid attention to, his characteristic modesty made him averse

to accept the position. He was led to accept from the fact that he would have the assistance of Mr. John B. Jervis as consulting engineer. These works were completed in 1849, and in that year he was called upon to advise concerning the proposed railroad between Halifax and Windsor.

In 1850 he was made sole Commissioner of the Boston Water-Works.

In 1851 he was appointed the first City Engineer of Boston. The Cochituate Water Board was created the same year, and Mr. Chesbrough had charge of all the water-works in addition to the other duties of Chief Engineer. The English system of sewers was at this time introduced into this country as a result of his investigations.

In 1855 he was invited by the Chicago Board of Sewer Commissioners to prepare the plans for a system of sewers for that city. After a visit to Europe, and a careful study of the systems in use there, he made an exhaustive report in 1858, which has become a standard for reference. The systems of sewerage and water-supply then recommended for Chicago were put into execution at once, although Mr. Chesbrough's connection with the construction of the sewers was merely nominal. His duties in planning and constructing the tunnels for obtaining water from the lake, the sewer tunnels, and the harbor-protection works occupied all his time.

He resigned as City Engineer in 1879, resigning at the same time the newly-created office of Commissioner of Public Works.

Among other important trusts filled by him are the following: He was consulting engineer on questions connected with the water-supply of Boston, Cambridge, Toronto, Memphis, Detroit, and New York City, and on sewerage for Burlington, Iowa, Chattanooga, Des Moines, Boston, Memphis, Providence, Peoria, and Dubuque. He also gave advice on numerous other projects for water-supply and sewerage.

In 1882 he went to Europe and studied the high masonry dams in Spain and France, and his reports, made in 1883, form the basis on which the Quaker Bridge Dam was designed. He acted as Consulting Engineer on the new water-supply for New York City from 1880 up to the time of making this report, which was the last work upon which he was engaged.

Mr. Chesbrough was elected President of the American Society of Civil Engineers for the year ending November, 1878, and was loved and esteemed by all the members who were so fortunate as to know him.

THE APPRENTICESHIP QUESTION IN NEW YORK—FEARS OF A STRIKE.

THE differences between the master and journeymen plumbers' associations, growing out of the journeymen's Reference Card No. 1, relating to hours, wages, and apprentices, have produced an uneasy feeling that a general strike will be ordered in this city, though hopes are still, at the time of going to press, felt that the matter may be adjusted. The substance of the parts of this card which are especially objected to by the Master Plumbers' Association—viz., the sections relating to apprentices—was given in our last issue, with the substitute offered by the master plumbers to the journeymen. The journeymen rejected the substitute, and on Wednesday of last week the matter was considered by the Master Plumbers' Association. The following resolution was adopted:

"Resolved, That the Journeymen's Union, in striving to control their employers in the management of their shops, especially in limiting the number of apprentices, are striking at the best interests of society, which require that boys, as far as is just and rational, should not be debarred from acquiring a knowledge of the trade, and that their conduct reflects but little credit on their intelligence, their humanity, or their desire to promote their own as well as the interests of the trade."

Reports of cases where strikes had been ordered in shops and the master compelled to pay fines for the time the men were out, were presented and increased the feeling of irritation, so that a series of resolutions were passed condemning this practice, which was termed "blackmail," favoring the preparation of lists to be hung up in the association rooms of journeymen who obtained money in this way, and pledging the association to "unqualified" resistance and possibly legal measures, to prevent the repetition of this assessment of the master plumbers.

On Thursday a call was issued by the President of the Master Plumbers' Association addressed to all employers of the plumbing trade in this city, whether members of the association or not, to meet in the association rooms, Monday, the 23d inst., to, as it ran, "materially aid and protect the very best interests of the trade, and so protect our customers and the public at large in their pockets and their health." The result was a very large meeting and a rather warm discussion. The correspondence between the Conference Committee and the Journeymen Plumbers' Association was read to get the questions in dispute clearly before the many present who were not members. Col. G. D. Scott, Mr. John Mitchell, and others made speeches, and the following resolutions were adopted:

"Resolved, That each and every member of this association place his name on a roll binding himself to abide by the action of the association.

"Resolved, That a committee be appointed to wait on absent members, and all plumbers doing business within the city, and endeavor to obtain their signatures for the above purpose.

"Resolved, That we do not wish to take the initiative, but when the Journeymen's Union takes action against an individual, or individuals, the members of this association be summoned at once to meet and devise the best course to be followed.

"Resolved, That we act as one man for the protection of each and every one in resisting all unjust demands on the part of the Journeymen's Union under penalty of immediate expulsion.

"Resolved, That the association pledge its cordial and co-operative support to the maintenance of the New York Trade Schools, and that we send one or more apprentices from each shop during the coming season.

"Resolved, That a Committee of Observation be appointed to watch the progress of events, and that it be empowered to employ a secretary to assist it."

The Committee of Observation was appointed as follows: Chairman, Joseph A. Macdonald, James Gilroy, H. G. Gabay, W. H. Quick, Edward Murphy, George D. Scott, Ferdinand Erhardt, J. M. Bracken, M. Willet.

The association will meet again to-morrow evening, and a public meeting will be held on Monday next.

DR. EZRA M. HUNT, of the New Jersey State Board of Health, with members of the local Health Board of Camden, N. J., last week made an inspection of the jail at Camden and found its condition so bad that it was declared a nuisance.

Gas and Electricity.

Illuminating Power of Gas in New York City.

Week ending	New York Gas-Light Company.	Manhattan Gas-Light Company.	Metropolitan Gas-Light Company.	Mutual Gas-Light Company.	Municipal Gas-Light Company.	Knickerbocker Gas-Light Company.	Equitable Gas-Light Company.
August 21.....	25.82	21.10	21.00	30.24	27.33	21.16	30.62

E. G. LOVE, Ph.D., *Gas Examiner.*

A CORRESPONDENT writes: "The new gas-well struck a few days ago at Bairdstown, Wood County, thirty miles south of Toledo, has just been tested by Prof. Orton, State Geologist, and found to have the marvelous capacity of 12,421,968 cubic feet per day, or greater than the famous Karg well, of Findlay, which now has to take the second place, its record by the same standard of measurement being 12,080,000 feet. The drillers struck the Trenton limestone at 1,041 feet, and could penetrate it only fifteen feet, when the tools danced up and down in it, the cable remaining slack. The immense volume of gas which now pours out of this well exceeds that of any other in the country, and is estimated to create a heat every day equal to that from 400 tons of Pittsburg coal. The gas, of course, all goes to waste at present, and may do so for months to come, but efforts are now being made to pipe it to this city, which will no doubt be done as soon as the necessary franchises can be obtained from the council. It is understood that the Standard Oil Company is back of the enterprise, and that abundance of capital will be forthcoming to carry it forward."

Patents.

No. 347,313, for water-closet handle or pull, is issued to Wallace H. Bate, Malden, Mass.

No. 347,368, for hose and coupling, is granted to Patrick J. O'Connor, San Francisco, Cal. The female section has a shoulder around which is a cam-ring, and the shoulder and ring have slots to receive lugs on the male section, so that when the male section is inserted in the female section and the cam-ring turned the parts are tightly held together.

No. 347,379, for a gasoline stove, is issued to James M. Reddy, of Chicago, Ill.

No. 347,383, granted Joseph T. Robbins, of Newton, Iowa, for apparatus for disposal of night-soil, consists of a urinal having a valve-seat extending horizontally, a privy-seat having a circular central opening and an intersecting opening to admit the urinal to extend upward therein, a reciprocating valve fitted to the under side of the valve-seat and inclosed in a pendent valve-chamber, valve-operating mechanism, a portable reservoir detachably connected with the lower end of the valve-chamber, and a tube connected with the urinal to operate in the manner set forth.

No. 347,390, for an automatic plug for wash-bowls and bath-tubs, is granted to Benjamin F. Smith, of Chicago, Ill. The waste-opening has a hinged cover and plug closed by a spring. The cover is connected with a lever and float so that on filling the basin to a certain height the float raises the cover and allows the bowl to discharge. The lever can also be moved by hand.

No. 347,392, granted to Maurice M. Smith, of Washington, D.C., for brick for ventilating, is a brick or building-block having ventilating-perforations extending entirely through it, and having flat binding-strips extending from the central portion of each end, as set forth. The combination, with the bricks constituting a wall, of a ventilating-brick of twice the thickness of the ordinary bricks in the wall, said ventilating-brick having perforations extending entirely through it from face to back, and having flat metallic binding-strips centrally secured, so as to project at each end and enter the mortar between the adjoining bricks, substantially as described.

No. 347,397, for a chuck for rock-drills, is granted to James G. Throckmorton, of Harvey's, Pa.

PERSONAL.

COMMODORE BANCROFT GHERARDI has been ordered to the Brooklyn Navy Yard, to succeed Commodore Chandler, who has been raised to the rank of Rear Admiral and appointed to the command of the Chinese squadron.

Notes.

For works for which proposals are requested, see also the "Proposal Column," pages 293 and 294

CONSTRUCTION.

PUMPING-ENGINES WANTED.—The Board of Trustees of Lake, Ill., have advertised for proposals for two horizontal compound pumping-engines, with boilers, etc. Address Joseph P. Gallagher, Town Clerk, Lake, Ill., until September 2.

WATER-WORKS WANTED.—Belfast, Me., wants a water-supply, and the Fire Department, T. W. Pitcher, Chairman of Select Committee, asks for proposals until September 4.

WATER-WORKS WANTED.—Newport, Ky., barracks wants a water-supply. Address proposals to Lieutenant E. S. Benton, Third Artillery, Assistant Acting Quartermaster, at Newport barracks.

GREENVILLE, S. C.—This place is much interested in obtaining a supply of water, and several projects, more or less vaguely presented, are before its citizens. Among those citizens specially interested are Mr. Julius C. Smith and P. H. Reilly.

WATERTOWN, DAK.—The town is considering the water-supply question. An artesian well is favored.

ALTOONA, PA.—The City Council has under consideration a report by C. W. Knight, civil engineer, on the providing of a water-supply.

MERCHANTVILLE, N. J., is seeking a water-supply, and Messrs. Howard Murphy and Isaac Cassin, civil engineers, have just made a report to the Merchantville Water Company. It is proposed to erect pumping machinery with a capacity of 500,000 gallons daily, drawing the supply from Pensauken Creek.

ST. PAUL, MINN.—On recommendation of the Board of Public Works the City Council has ordered the construction of the approaches to the proposed bridge over the tracks of the St. Paul, Minneapolis, and Manitoba Railroad; cost estimated at \$45,000.

BATTLE CREEK, MICH.—MacRitchie & Nichol, of Chicago, have been awarded the contract for building water-works; estimated cost, \$100,000.

BOSTON, MASS.—The following bids were received August 16 for building the abutments of the Boylston Street bridge: Putterell & Killian, \$74,975; Boller & McGaw, \$96,490; Sylvester & Rowe, \$73,977; J. H. Leavitt, \$84,000; T. F. Maney & Co., \$84,705; Boynton Bros., \$88,714; M. Meehan, \$63,600; William H. Ward, \$94,200; O'Connor & Co., \$84,921.

After consideration of the pumping-engines, for the furnishing of which proposals were made the water board, the contract for the Fisher Hill high-service pumps has been awarded to the Holly Manufacturing Company. The pumps are to be of 8,000,000 gallons each, and the workmanship will be of the best quality. The price to be paid by the city is \$50,000 for the two. By this arrangement the city saves \$56,000 and the old Elmwood station engines which another contractor would have received had the contract made by the old water board been carried out.

BOSTON, MASS.—Bids for building a pumping-station in West Roxbury for the high service on Washington Street, near Clarendon Hills, have been received as follows: George L. Eldredge, \$5,081; O'Connor & Co., \$4,822; D. H. McKay, \$5,700; Benjamin F. Dewing, \$6,132; Michael Meehan, \$5,205; Wentworth & Orne, \$5,100; J. H. Coon & Co., \$6,192; Robert R. Mayers & Co., \$5,550.

DENVER, COL.—The Supervisors have settled it that North Denver viaduct at Twenty-third Street shall be built.

BROOKINGS, DAK.—The City Council, August 12, awarded the contract for boring an artesian well to Gray Bros., of Milwaukee, the lowest bidders. The price to be paid is \$4.50 per foot, including tubing.

TORONTO.—The council has determined to submit a by-law for \$300,000 to the people for the straightening of the River Don. The work is much needed upon sanitary grounds, as the district is now a filthy malarial marsh. Some action will be taken this year to commence the trunk sewer. It is probable a vote will be taken to enable the council to spend \$300,000 next year in constructing the outfall and that portion of the main sewer on the low level which will carry away all the sewage now entering the harbor and polluting the wharves. The proposal is to spend \$300,000 in the first year, \$200,000 in the second, and \$250,000 in each of the third and fourth years. The total addition to the taxation will not be wholly reached till 1892-3, and will not exceed half a mill on the dollar.

LOCKPORT, N. Y.—The Lockport Water-Supply Company is sending out prospectuses of its project for bringing water for power and all purposes from the Niagara River to Lockport in tunnel and open conduit. John Hodge is president, and Charles Whitmore is secretary of the company.

STORM KING BRIDGE.—Mr. Charles Swan, at the Washington Building, New York City, informs the *World* that work on this bridge over the Hudson River will begin in a short time.

GREELEY, COL.—A company has been organized here under the name, "Greeley Artesian Water Company," to furnish a supply of water for fire purposes from an artesian well. J. M. Wallace is President, and L. W. Hooper is Secretary.

THE "tank" water-works of Katonah, N. Y., supplied from a spring and furnishing water to several residents, was blown up by dynamite the night of August 18, by some malicious person.

CROOKSTON, MINN.—The Red River Valley Drainage Commission, at a meeting here August 16, reported that Clay, Norman, Polk, and Marshall Counties had made arrangements for their apportionments of the funds for topographical survey of the valley, and that the chief engineer would put surveying parties in the field at once.

WEST TROY, N. Y.—The contract for constructing about eighteen miles of sewers has been awarded to Emmett Flagler, of West Troy, at \$64,700. We give below his bid on the several items. The highest bid aggregated \$198,000:

Price per lineal foot for furnishing and laying 18-inch pipe, including Ys, branches, detachable covers, and cement joints.....	\$0.76
Price per lineal foot for furnishing and laying 15-inch pipe, including Ys, branches, detachable covers, and cement joints.....	52
Price per lineal foot for furnishing and laying 12-inch pipe, including Ys, branches, detachable covers, and cement joints.....	40
Price per lineal foot for furnishing and laying 10-inch pipe, including Ys, branches, detachable covers, and cement joints.....	33
Price per lineal foot for furnishing and laying 8-inch pipe, including Ys, branches, detachable covers, and cement joints.....	23
Price per lineal foot for furnishing and laying 6-inch pipe, including Ys, branches, detachable covers, and cement joints.....	18
Price per lamp-hole, including all materials and labor.....	7.50
Price per manhole, including all materials and labor.....	28.00
Price per flush-tank, including all materials and labor, except the emptying device.....	40.00
Price per lineal foot for all excavation and back-filling under six feet deep.....	14
Price per lineal foot for all excavation and back-filling six feet or over, and under eight feet..	18
Price per lineal foot for all excavation and back-filling eight feet or over, and under ten feet..	22
Price per lineal foot for all excavation and back-filling ten feet or over, and under twelve feet.	25
Price per lineal foot for all excavation and back-filling twelve feet or over, and under fourteen feet.....	40
Price per lineal foot for all excavation and back-filling fourteen feet or over, and under sixteen feet.....	55
Price per lineal foot for all excavation and back-filling sixteen feet or over, and under eighteen feet.....	75
Price per foot for 3-inch drain-tile properly laid on boards, with covered joints.....	5
Rock trench per lineal foot, per foot in depth....	14
Price per lineal foot for repaving.....	5
Manholes, complete, each.....	42.00
Lamp-holes, complete, each.....	7.50
Flush-tanks, complete, each.....	60.00
Price per ton for iron pipe, laid with lead joints, complete.....	42.00
Rock-work, price per cubic yard.....	1.90
Extra work according to engineer's estimate.	

GOVERNMENT WORK.

FRANKFORT, KY.—Synopsis of bids for hardware for post-office, etc., opened August 14, 1886: A. G. Newman, \$500; Hopkins & Dickinson Manufacturing Co., \$402.68; J. D. Schroeder & Co., \$424.52; P. & F. Corbin, \$420.08.

LEAVENWORTH, KAN.—Synopsis of bids for iron beams, etc., for first floor of courthouse, etc., opened August 20, 1886: Clark, Raffin & Co., \$1,293; Phoenix Iron Co., \$1,466.05; Dearborn Foundry Co., \$1,321.33; L. M. Morris, \$1,574.54; Union Foundry and Pullman Car-Wheel Works, \$1,390; A. & P. Roberts & Co., \$1,300; Haugh, Ketcham & Co., \$1,138.19; Thomas Marshall, \$1,552.50; Union Stove and Machine Works, \$1,284.40; Snead & Co. Iron-Works, \$1,475; Insley, Shinn & Tulloch \$1,300; Phoenix Iron Co., \$1,354.56.

JACKSON, TENN.—Synopsis of bids for glazing, painting, and polishing for courthouse, post-office, etc., opened August 19, 1886: Matthew Madden, \$1,864; J. G. Jester & Co., \$573.75; Robert Mitchell Furniture Co., \$1,650; John W. Carr, \$1,052.80.

LIST of proposals received and opened August 23, 1886, in the office of the Supervising Engineer and Architect of the new Pension Building, at Washington, D. C., for extending wrought-iron gallery around hall: C. Hitzeroth, Philadelphia, Pa., \$6,988; Hecla Iron-Works, New York, \$9,000; Haugh, Ketcham & Co., Indianapolis, Ind., \$7,000; Cheney & Hewlett, New York, \$9,600; Pennsylvania Construction Co., Pittsburg, Pa., \$6,150; James McKinney & Son, Albany, N. Y., for two galleries 70 feet each, \$1,411.69; Manly & Cooper

Manufacturing Co., Philadelphia, Pa., \$8,123; East River Iron-Works, New York, \$11,500; West Point Engine and Machine Co., West Point, Pa., \$6,367.17; John J. Bower, New York, for two galleries, \$1,793; Aetna Iron & Steel Co., Chicago, Ill., \$12,315; Harris & Winslow Co., Chicago, Ill., \$7,525. Award made to the Pennsylvania Construction Co. at their bid.

SYNOPSIS of bids for sheet copper (24x48-inch, 14-ounce), opened August 14, 1886:

BIDDERS.	Fort Wayne, Ind. 770 Sheets.		Council Bluffs, Iowa. 775 Sheets.		Eric, Pa. 1,360 Sheets.		Lynchburg, Pa. 305 Sheets.	
	Per Sheet.	Time.	Per Sheet.	Time.	Per Sheet.	Time.	Per Sheet.	Time.
Baltimore Copper Rolling Mill.....	\$1.60	10 days	\$1.60	10 days	\$1.60	10 days	\$1.60	10 days
New Bedford Copper Co.....	1.60	2 weeks	1.60	2 weeks	1.60	2 weeks	1.60	2 weeks
Detroit Copper and Brass Rolling Mills.....	1.60	30 days	1.60	30 days	1.60	30 days	1.60	30 days
Ansonia Brass and Copper Co.....	1.60	2 weeks	1.60	2 weeks	1.60	2 weeks	1.60	2 weeks
Taunton Copper Mfg Co.....	1.60	3 weeks	1.60	3 weeks	1.60	3 weeks	1.60	3 weeks
Pittsburg Copper and Brass Rolling Mills.....	1.60	10 days	1.60	10 days	1.60	10 days	1.60	10 days
Park Bros. & Co. (limited).....	1.60	2 weeks	1.60	2 weeks	1.60	2 weeks	1.60	2 weeks

LIST of bids received and opened on August 23, 1886, in office of Supervising Engineer and Architect of new Pension Building, for furnishing iron or steel floor-beams: Passaic Rolling-Mill Co., Paterson, N. J., \$13,045.26 on cars, \$13,262.68 delivered; E. N. Gray & Co., Washington, D. C., \$13,122.25, delivered. Award made to E. N. Gray & Co.

MR. LACOMBE sends his opinion to the Aqueduct Commissioners concerning the refusal of the contractors to obey the clause of the contract providing for suitable light and ventilation. The Corporation Counsel says that when any contractor violates any of the conditions of the contract, the commissioners have power to order the contractor to stop work, and to continue it themselves at the expense of the contractor.—*N. Y. Star.*

LATE NEW YORK BUILDINGS.

135-136 Willow av, e s, br factory; cost, \$19,000; o, W. W. Fouché, Jr.; a, G. R. Robinson, Jr.

West End av, n e 75th st, 10 dwells; cost, one \$40,000; three \$20,000; three \$14,000; three \$13,000; o, Wm. J. Merritt & Co.; a, Chas. Mate.

Edgecombe av, n e cor 135th st, 2 dwells; cost, \$14,000 and \$18,000; o, Dore Lyons; a, Wm. J. Merritt & Co.

525-27 W. 51st st, 2 flats; cost, each, \$20,000; o, S. H. Mapes; a, C. H. French & Co.

ALTERATIONS.

Pier 25, N. R., frame shed; cost, \$10,000; o, Pine, Forwood & Co.

BUILDING INTELLIGENCE.

(Continued from page 294.)

BROOKLYN—(Continued).

Bushwick av, n w cor Adams st, 2 4-story br stores and tens; cost, \$7,000 and \$6,500; o, Henry Huether, Bushwick av and Beaver st; a, G. Hillenbrand; b, not selected.

48th st, s s, 200 w 4th av, 5 2-story fr dwells; cost, ea, \$2,000; o, etc., J. R. Schoonover, 385A 12th st.

737 Broadway, n e cor Locust st, 4-story br store and dwell; cost, \$11,000; o, John Dittich, 236 Graham av; a, Th. Engelhardt; b, W. Maschke and J. Rueger.

Fulton st, s e cor Kingston av, 3 4-story br stores and dwells; cost, each, \$6,500; extension, \$1,800; o, Ernst Eggert; a, G. Damen; b, not selected.

Berkeley pl, s s, 80 w 7th av, 3 3-story and bmt br and b s dwells; cost, each, \$5,500; o, a, and b, C. B. Sheldon, 296 9th st.

1st st, s s, 96.6 w 5th av, 4-story b s ten; cost, \$10,000; o, Hegedorn & Squance, 6th av and 11th st; a, F. T. Camp.

Graham st, e s, 100 s Myrtle av, 2-story br engine-house; cost, abt \$9,000; o, City of Brooklyn, Mayor's office; a, Dep't of City Works; b, —Collins.

Tompkins av, s e cor McDonough st, 3-story and bmt br dwell; cost, \$14,000; o, J. D. Sullivan, Decatur st, a, J. Reemer; m'n, not selected; c'r, A. W. Blazo.

Garfield pl, s s, abt 275 w 7th av, 5 3-story and bmt br dwells; cost, each, \$6,500; o, a, and b, C. B. Sheldon, 296 9th st.

3d st, s s, 275 w 4th av, 2 2-story and bmt fr (br filled) dwells; cost, \$4,500; o, John Feitner, Jr., 186 18th st; a, W. H. Wirth; b, —Dieckmann and J. Kollé.

5th av, w s, 22 s 1st st, 3 4-story b s stores and tens; cost, \$36,000; o, Hagedorn & Squance, 6th av and 11th st; a, F. T. Camp.

5th av, s w cor 1st st, 4-story b s store and ten; cost, \$20,000; o and a, same as last.

Waverley av, w s, 164 s Park av, 4-story br ten; cost, \$7,000; o, Peter McGoldrick, Washington av, near Park av; a, T. F. Houghton.

ALTERATIONS, NEW YORK.

190-198 6th av, n e cor 12th st; cost, \$7,000; o, Estate W. C. Rhineland, dec'd; lessee, J. B. Wheeler, 47 W 57th st; a, J. J. Lyons; b, H. M. Reynolds.

MISCELLANEOUS.

ALBANY, N. Y.—State st, cor Eagle, improvements; cost, \$12,000; o, Dr. Vanderveer; a, Fuller & Wheeler; b, Stephens & Shattuck.

State st, stone dwell; cost, \$16,000; o, H. K. Tebbutt; a, Ogden & Wright; b, Stephens & Young.

West st, 4 fr houses; cost, ea, \$2,000; o and b, T. Stephens.

Quail st, 2 br houses; cost, \$4,000; o, McMurry & Lawrence; b, Carr & Burdick.

165 Hamilton st, br and st dwell; cost, \$8,000; o, L. Hotaling; a, Ogden & Wright; b, Havens & Young.

BALTIMORE, MD.—306 Caroline, 3-story br warehouse; o, J. H. Thiemeyer & Co.

374 Hamburg, 3-story br dwell; o, W. J. Klug.

Stricker st, 3-story br dwell; o, John Harris.

Charles, near Hoffman, 3 3-story br dwells; o, Dr. Wm. A. Moale.

Penna. av, near Lanvale, 4 3-story br dwells; o, Dr. Wm. A. Moale.

Light, near Ostend, 3 3-story br dwells; o, Eleanor A. Moale.

BOSTON, MASS.—St. Botolph, cor Durham, 7 br apart. hotels; cost, \$125,000; o, G. M. Nason; a and b, E. Potter.

Smith Court, br dwell; cost, \$7,000; o, J. G. Abbott; b, G. F. Burnham.

Harrison av, cor Exeter Place, br mercantile bldg; cost, \$45,000; o, H. H. Hunnewell; b, Lyman Wilcutt.

93-105 South st, br mercantile bldg; cost, \$200,000; o, heirs Richard Bocker; b, H. McLaughlin.

455-57 Beacon st, br dwells; cost, \$60,000; o and b, Asa H. Caton.

Huntington av, cor W. Newton, br apart houses; cost, \$75,000; o, G. N. Nason; b, A. S. Potter.

BUILDING INTELLIGENCE.

BUFFALO, N. Y.—Vermont st, Public School, No. 18; cost, \$35,000; o, City of Buffalo; a, R. A. & L. Bethune; b, T. Savage.

North st, store; cost, \$10,000; o, W. Guenther; a, R. A. & L. Bethune; b, L. Leinert.

Jersey, cor West av, br dwell; cost, \$8,000; o, S. L. Mason; a, Swan & Falkner; b, Wm. Schumacher.

Linwood av, fr dwell; cost, \$4,500; o, L. F. Messer; a, Swan & Falkner; b, Emory Close.

Linwood av, fr dwell; cost, \$4,500; o and b, Emory Close; a, Swan & Falkner.

CHICAGO, ILL.—Cor of Center and Sheffield sts, 3-story flats; cost, \$9,000; o, L. Kinder; a, W. Ohlabel; b, W. Prhlar.

229 La Salle, 3-story and flats; cost, \$12,000; o, Mary E. Gross; a, H. Seerks; b, Fred. Sieman.

313-319 Wabash, st bldg; cost, \$100,000; o, J. Q. Adams; a, Treat & Folz; b, A. Bientalt.

320-266 Superior, 3-story dwell; cost, \$40,000; o, E. Cobb; a, Cobb & Frost; b, Crace & Davis.

150-160 W Erie, factory; cost, \$25,000; o, F. Hubald; a, F. H. Kully; b, Ropes & Koch.

2266-68 Archer, stores and flats; cost, \$16,000; o, R. W. Healey; a, Furst & Rudolph; b, J. E. Kavanaugh.

235-239 W North, stores and flats; cost, \$10,000; o, Dr. Enrich; a, G. Neil; b, Getjahi & Co.

445-457 Ogden, stores and flats; cost, \$21,000; o, W. P. Fitzpatrick; a, J. U. McMallock; b, W. H. Cameron.

345-351 Ogden, stores and flats; cost, \$22,000; o, Stoneham, Lewis & Durand; a, J. McGrath; b, Cameron & Son.

Fullerton av and North Halsted, McCormick Presty. Theol. Seminary; cost, \$100,000; a, A. B. Brown, of New York; b, S. Messersmith.

606 Wells, 3-story br; cost, \$12,000; o, E. M. Buehler; a, J. H. Huber; b, Pauli & Becher.

206 Division, 3-story br; cost, \$16,000; o, M. McGurin; b, Agneed & Gill.

390-4 North av, 3-story br flat; cost, \$16,000; o, W. C. Ganz; b, Agneed & Gill.

33-35½ Depuyster, 2-story br; cost, \$13,000; o and b, W. Rutherford; a, S. M. Randolph.

Winconsin Central R. R., freight-house; cost, \$16,000.

606 N. State, 2-story br; cost, \$20,000; o, A. M. Pence; a, N. Gedell; b, C. W. Hellman.

CLEVELAND, O.—1299-1303 Wilson av, double fr dwell, 2-story and attic; cost, \$12,000; o, W. H. Brown; a, Frank H. Norton; b, Robt. McQuoid.

1344 Wilson av, 2-story and attic fr dwell; cost, \$7,000; o, Jas. Corrigan; a, Coburn & Barnum; b, J. Venning.

142-4 Quincy, double 2-story fr store and dwell; cost, \$4,000; o, Anton Wagner; a, P. Geier; b, Kreigh.

119 Quincy, 2-story fr dwell; cost, \$2,500; o, J. P. Green; a and b, H. Hamley.

S w cor Slater & Quincy, 2-story fr dwell; cost, \$4,000; o, P. Dorn; a, Fred. Ruhl; b, Chas. Ruhl.

34 Quincy, 2-story fr dwell; cost, \$4,000; o, W. Stumpf.

1262 Wilson, addn to front, b s trimmings; cost, \$6,000; o, Dr. J. M. Lewis; a, Coburn & Barnum; m'n, H. Paul; carp'r, L. Wherry.

Ontario, nr High st, bus. block, 5-story pressed br and st; cost, \$38,000; o, Bradley Estate; a, F. C. Bate.

CLEVELAND, O.—The Board of Infirmary Directors have decided that plans for a new hospital for contagious disease cases shall be drawn and the building erected. City Health Officer Ashmun can give information.

DETROIT, MICH.—Washington st, br factory, cost, \$16,000; o, Edison Electric Light Co.; a, Hess & Raseman.

73 Hendric av, fr dwell; cost, \$10,000; o, F. E. Rankin; a, B. W. Joy; b, A. Beaton.

BUILDING INTELLIGENCE.

EAST MADISON, WIS.—A railway depot for the St. Paul Railroad will be built here. Bids have been received.

FORT PLAIN, N. Y.—Br and stone S. S. and church; cost, \$35,000; o, Trustees First Presb. Church; a, Fuller & Wheeler; b, contract not let.

(Continued on page 309.)

ANNOUNCEMENT.

The publication of the sixth revised edition of the U. S. Pharmacopoeia (1880), containing as it does much more strict requirements for the purity and strength of pharmaceutical preparations, has been followed in some States of the Union by the enactment of laws against the adulteration of drugs, which laws make the Pharmacopoeia the official standard.

In accordance with our established policy we shall, as in the past, use our best endeavors to furnish only such preparations as shall meet pharmacopoeial requirements. We are heartily in sympathy with all efforts which aim to improve the quality of medicines, and shall continue as heretofore to exclude all low grade and inferior articles and to use our influence to promote the sale and use of pure drugs and medical preparations.

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PROBLEMS.

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THE NEW COMMISSIONER OF THE DEPARTMENT OF PUBLIC WORKS.

GOVERNOR HILL is to be commended for promptly approving of the removal of Public Works Commissioner Squire by Mayor Grace of this city, and the Mayor is to be commended and this community congratulated on the appointment of General John Newton, late Chief of Engineers, United States Army, as his successor.

Besides putting a positive force for intelligent work in the New Aqueduct Commission—a force that has been sadly lacking from the inception of the work—this city has now a gentleman at the head of its Public Works Department who, together with his eminence as an engineer, possesses the universal confidence of the press and public in his honesty and capacity. This is most fortunate, because, besides the money to be spent in increasing our water-supply, the department which he is to conduct imperatively needs liberal appropriations for the preservation of its local water-distribution plant, including the enforcement of waste-prevention measures; also for sewers and pavements. These have been in a large measure withheld not because they were considered unnecessary, but because it was believed that the money, if appropriated, would be stolen in part, and the work only partially and indifferently done. In a few months General Newton will know what work is imperatively needed, and will make his requisition for funds. Will the press, that so warmly hails his appointment, assist him then in getting the money his department needs? And when he gets the money—which we hope he may—will our daily papers open their columns to uninvestigated charges of fraud or favoritism at the instance of any disappointed contractor that sees fit to make or inspire them? They will have ample opportunity, because in the measures he may adopt, and the men and appliances he may select, he must necessarily make a choice among many. The ready publication of charges of this character, so often thus inspired, has destroyed the usefulness of many an honest and capable officer less well known than General Newton. At best, he will have no easy berth as the head of the Department of Public Works, and he will need the support of the press of this city, and of all honest citizens, if his administration shall fulfill general expectations.

THE CAUSES AND PREVENTION OF CONSUMPTION.

WHAT is popularly known as consumption includes several very distinct diseases of the lungs, but the great majority of cases are due to what physicians call tuberculosis—that is, the production in the lungs of certain material of a low grade of organization known as tubercle.

Tubercle may occur in other organs besides the lungs, and in certain stages of its development or decomposition it is difficult to distinguish it from some of the products of simple inflammation, but it is now generally agreed that wherever true tubercle is found there will also

be found a micro-organism known as the *bacillus tuberculosis*. This bacillus can be cultivated, and in its growth it presents peculiar phenomena by which it can be identified. The product of the last of a long series of cultures when inoculated into certain living animals will produce tuberculosis in them. We therefore say that the *bacillus tuberculosis* is the cause of tubercle, meaning by this that without it there can be no true tubercle. But it requires something more than the mere presence of the bacillus to produce the specific disease. The bacillus exists in large numbers in the matter spit up by those affected by it. It is very tenacious of life, and retains its powers unimpaired if the sputa containing it be dried and ground to dust.

The number of persons who are affected with consumption is very large. The majority of them take exercise out of doors, and in the course of a year there are probably very few persons living in New York who do not inhale some of these dried, yet living germs. Why, then, does the bacillus grow and produce its deadly effects only in certain persons?

To this question science at present can give no complete answer, but it can tell us something nevertheless. In the first place, the bacillus grows best in persons whose parents were tubercular. The influence of heredity on the disease is well known. In the second place, it is most likely to flourish in persons weakened by other diseases, and in lungs whose vitality has been injured. It is especially apt to follow certain diseases—as, for example, chronic pleurisy, or measles. It flourishes among persons who breathe air contaminated by the products of respiration of others. No doubt this is partly due to the fact that, in close, ill-ventilated rooms, if one person is affected with the disease and is contaminating the air with the bacillus, all others in his vicinity inhale an unusually large number of the bacilli, but the foul air itself so influences the living surface of the air-passages as to accumulate dead or dying matter on it, and so furnish food for the germ.

It will be understood from this that consumption is contagious, and of this there is little doubt; but, fortunately, the great majority of people, while in ordinary good health, are not susceptible to the contagion unless an unusually large amount of it gains access to their lungs.

The bacillus requires heat, moisture, and nutritive material for its growth. Pure cool, dry air prevents its multiplication. In ordinary cases of consumption it is given off almost exclusively in the sputa.

Now, while our knowledge about the causes of consumption is not very complete or definite, it will be seen that it is sufficient to indicate some important means of prevention. In the first place those who know that "consumption is in the family," as the ordinary phrase is—that is, whose parents, brothers, or sisters have had the disease—are forewarned that it is specially dangerous for them to live in close, ill-ventilated rooms and on damp subsoils. Life in the open air, and especially in a cool, dry air, with plenty of

sunshine, is what they should seek, and they should do this before the disease appears.

In the second place, the thorough and prompt disinfection of the sputa of consumptive patients before it has time to dry is a matter of great importance to the public health, so much so that it is the imperative duty of such patients and of their physicians and attendants to see that this is carried out.

The extent to which consumption can be prevented in a community if it is treated as a contagious disease is shown by the experience of Naples, where for over eighty years it was so treated, with precautions so rigid as to be inhumane, but with the result of practically stamping out the disease.

Among the modes by which the germ of tubercle may be conveyed mention should be made of the meat and milk of tuberculous cattle. The danger from the milk of tuberculous cows is probably small, though sufficient to warrant pre-

OUR BRITISH CORRESPONDENCE.

Institute of Architects' System to Facilitate Inspection of Buildings by Members—Drainage of the Palace of Westminster—An Architect's Suit Against an Engineering Firm—Poplar Public Baths—Knighthood Awarded to Mr. Philip Magnus.

LONDON, August 14, 1886.

THE commendable system is adopted by the Institute of British Architects intended to facilitate the inspection of notable buildings by its members. Members of this institute who propose traveling with the view of studying notable examples can, on application, be provided with a card requesting all custodians, etc., in the name of the institute, to afford any reasonable facilities and assistance that may lie in their power to the bearer of the card, whose name he will find thereon, and to allow him, should he be desirous, to sketch, measure, or otherwise examine the building in question. The card is in English, French, German,

erally. The commission charged was at the rate of 2½ per cent. The defendants' contention was that not all the buildings had been erected, and they objected to pay except for those that had been put up. The buildings erected seem to have been completed in June, 1885. It would appear from the evidence that it was not intended to erect the other buildings, but the jury found for the full amount claimed.

The new works of the public baths at Poplar are just completed, the cost having been some £7,000 (\$33,600). The new plunge-bath is seventy-five feet by twenty-six feet, the depth sloping from three feet six inches to six feet nine inches. A feature in the alteration is that the old boilers, having been condemned as ineffective, have been replaced by two new 24-foot Cornish boilers, five feet six inches in diameter, the old boilers being placed on iron girders over the new, being destined to act as water-heaters.

Amongst the batch of "honors" awarded by the outgoing Liberal Government is one of knighthood to Mr. Philip Magnus, the Director of the City and Guilds of London



A RESIDENCE AT GERMANTOWN, PA.—G. W. & W. D. HEWITT, ARCHITECTS.

ventive effort, but that from the meat of tuberculous animals is probably very real. Where there is any proper inspection of the markets very little of this meat is sold in its natural state, but it goes into the so-called bologna sausages, and is disposed of in other ways which require more attention than they have yet received.

MR. FREDERICK BAUMANN, an architect of Chicago, has submitted to Dr. De Wolf, Commissioner of Health, a plan for disposing of the dead. Mr. Baumann proposes to erect an edifice resembling the ancient Tower of Babel, with a gradually ascending stairway, and which might be carried to any height that was desirable, from twenty-five to fifty stories. Vaults may be built in this building, which could be sold or rented for single interments or for the accommodation of families. At all times a huge fire is to be kept burning in the basement of this hollow centre

Italian, and Spanish, and will unquestionably be a boon to members of the institute.

Acting on the recommendation of the committee appointed by the House of Commons to consider the question of the drainage of the Palace of Westminster, the work has now been put in hand, the engineer in charge being Mr. Isaac Shone, C. E., of 4 Westminster Chambers. The remedial measures recommended by the committee, as stated in my letter of July 3, that the palace drain shall be disconnected with the low level metropolitan sewer, and that the Shone hydro-pneumatic sewerage system be adopted, have been accepted. John Mowlem & Co., of Westminster, have undertaken the contract for the excavating and general work; Hughes & Lancaster, of Chester and Liverpool, that for the Shone hydro-pneumatic ejectors, and the British Gas Engineering Company, of London, for the gas-engine air-compressors to work the ejectors.

An action taken by a Birmingham architect, Mr. Joseph Crouch, against Beasley & Co., engineers, of Bracebridge Street, in the same town, for the recovery of £37 (\$177.60), fees for services rendered, is of interest to architects gen-

Institute for the Advancement of Technical Education, for special services rendered in connection with the object of the institute during the past two years. SAFETY-VALVE.

OUR ILLUSTRATION OF A MODERATE-COST HOUSE.

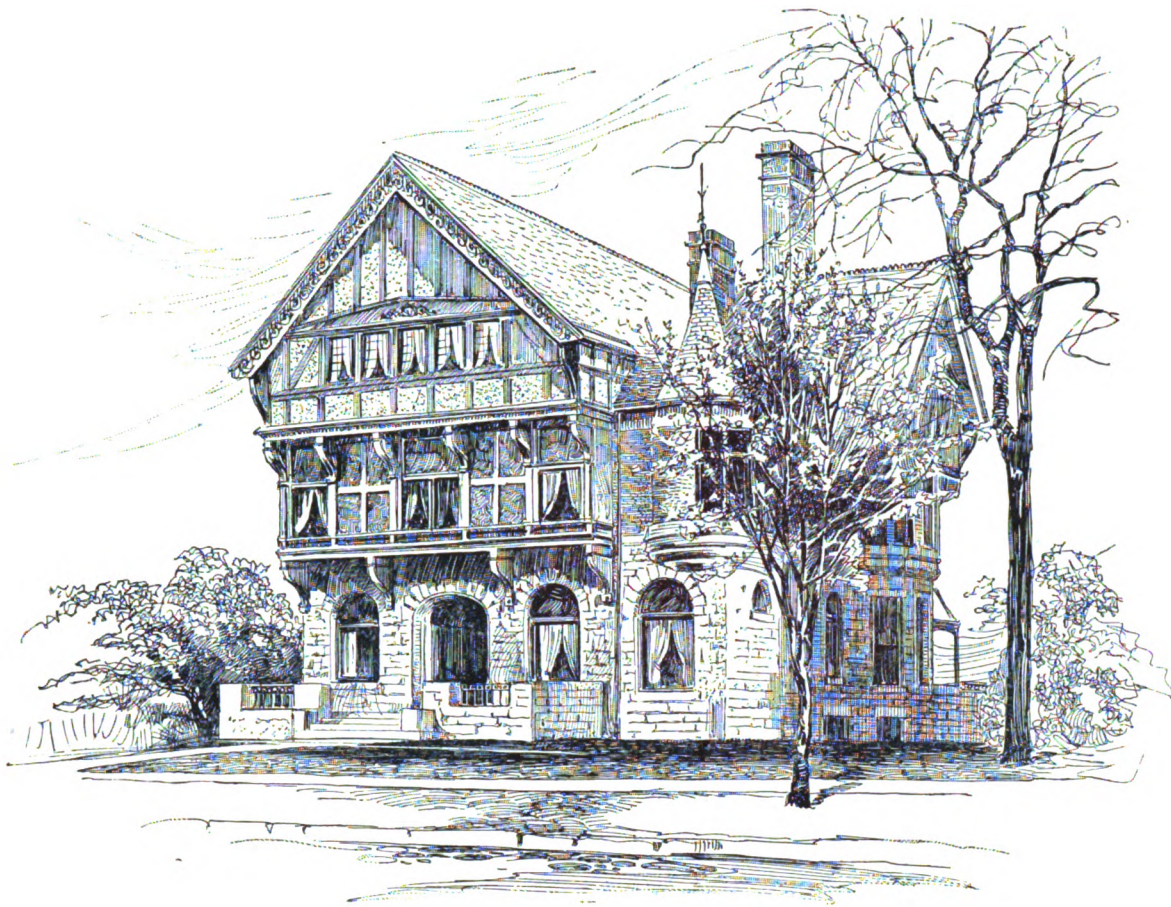
A RESIDENCE AT GERMANTOWN, PA.

THIS house is the residence of William C. Sharpless, Esq., at the corner of Wayne and School Streets, Germantown, Philadelphia. The house is of rubble masonry of local gray limestone. The architects are Messrs. G. W. & W. D. Hewitt, of Philadelphia.

OUR SPECIAL ILLUSTRATION.

SUBURBAN RESIDENCES AT DETROIT, MICH., AND DORCHESTER, MASS.

THE Detroit house of which we publish a view and plan is the residence of Judge H. B. Brown, on Jefferson Avenue. The lower story is of stone, the upper stories of brick, with half-timber work in the gables. The interior is elaborately



DETROIT.—W. H. MILLER, ARCHITECT.



DORCHESTER.—CABOT & CHANDLER, ARCHITECTS.

THE SANITARY ENGINEER ILLUSTRATED SERIES.

SUBURBAN RESIDENCES AT DETROIT, MICH., AND DORCHESTER, MASS.

finished in hard woods. The architect is Mr. W. H. Miller, of Ithaca, N. Y.

The house at Dorchester, Mass., is the residence of E. Torrey, Esq. The lower story is of brick and rubble stone. The upper story is shingled and the gables are filled with half-timber work. The interior is finished in hard woods, the hall and dining-room in quartered oak, the sitting-room in cherry. The architects are Messrs. Cabot & Chandler, of Boston, Mass.

The floor-plans are printed below.

THE WATER-TOWER AT ASBURY PARK.

THE rapidly increasing demands for water at Asbury Park have made it necessary to run the pumps at times faster than it is desirable. The pumps discharge directly into the mains, and although their capacity is abundant if storage were provided, the draught at certain hours is fully up to their capacity. For this reason a stand-pipe, with a capacity of 100,000 gallons, is being erected at about a mile north from the pumping station as an equalizer. The pumps are located in the southern part of the town, and take water from four 4-inch tube-wells sunk 450 feet through the earth to a stratum of water-bearing gravel (and below an impervious stratum), evidently connected with a higher source, since the water will rise twelve feet above the earth. These wells are at distances of about 400 feet apart, and it is found that rapid pumping at Ocean Grove from a similar well 600 feet away sensibly affects the supply. In another article we propose to give some further information respecting the water-supply from this source.

The water is raised by a compound duplex pumping-engine. The steam-cylinders are 8"x12" and 12"x12", and the water-cylinders 8"x12". The guaranteed capacity is 1,000,000 gallons per day against a head of 125 feet. The present amount pumped per day is about one-half this, with a pressure, ordinarily, of twenty-five pounds.

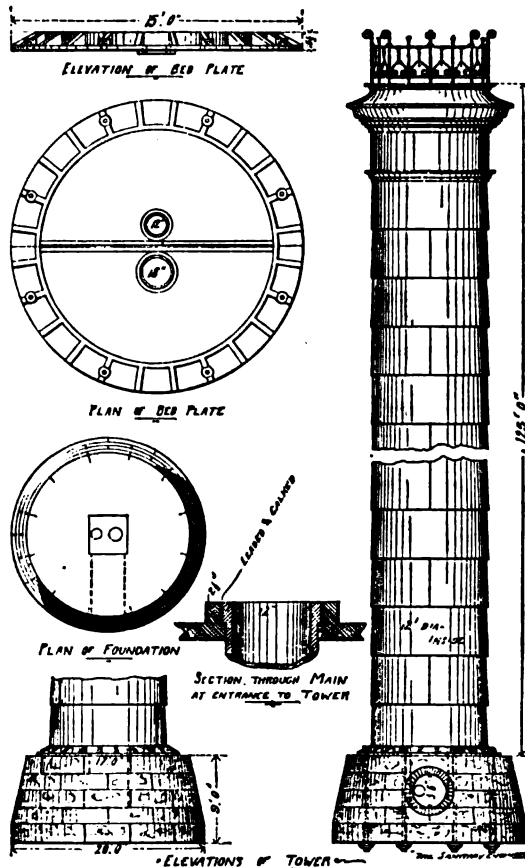
On testing the ground for the foundation, a soft stratum was struck at about six feet below the surface. An excavation was therefore made to about this depth, and 189 piles driven in it to a depth of about twenty feet, at which point the earth was somewhat harder.

This compacted the soil so that the last piles were driven with difficulty. The piles were sawed off at a level of six feet below the curb, and the earth cleared from between them to a depth of two feet. Concrete was then filled between them, and also over their tops to a depth of six inches. On this the stone foundation was started with twenty inches diameter. The masonry was carried to three feet above the curb, the sides being battered so as to give a diameter of seventeen feet at top.

A massive bed-plate, fifteen feet in diameter, was placed on this and held down by eight screw-bolts 2½ inches diameter. These passed down through the masonry, and took hold of it below by heavy cast washers twenty-four

inches square and six inches thick. The plate, as also its flanges and ribs, was 2½ inches thick throughout. On account of difficulty in transportation, it was cast in two halves, with vertical flanges three inches high for joining them, the parts being held together by twelve bolts of 1½ inches diameter each. The joint was made water-tight by filling it first with lead to the under side of the bolts, and calking, and then filling and calking the remainder.

The vertical circular flange within which the wrought stand-pipe rests is eight inches deep, and the plate is



ASBURY PARK WATER WORKS
• WATER TOWER •

stiffened outside of this flange by twenty-four radial ribs. There is a manhole eighteen inches in diameter through the plate, closed below by a cap held in place by twelve copper tap-bolts, each of ¾-inch diameter. The casting for the manhole is special and similar to that for the water-main.

The water-main enters through the main bed-plate, the opening having the same diameter as the exterior of the main. There is a vertical circular flange above the plate

of about two inches greater diameter. The hub of the special casting of 12-inch internal diameter at end of main rests on the ledge thus left, and the joint between flange and hub is securely leaded.

The main enters the masonry through a tunnel three feet six inches in diameter. It is of 12-inch cast pipe, and the distribution consists now of about 50,000 feet, varying from four inches to twelve inches.

The stand-pipe is 125 feet high and twelve feet internal diameter, and consists of twenty-five rings, each five feet high. The lowest five are ⅞ of an inch thick, each five reducing ⅛ of an inch, so that the upper set is ⅝ of an inch. The lowest ring is leaded into the bed-plate. The vertical joints are double-riveted, and the horizontal single-riveted. In the lowest set ⅝-inch rivets with 2 ⅝-inch pitch are used, for the ⅝-inch plates ¾-inch rivets with 2 ¼-inch pitch, and in the top set ⅝-inch rivets with 1 ⅞-inch pitch are used. The rings are put together stove-pipe fashion, the smaller end uppermost; by this means, the upper edge being chamfered in the shop, all calking can be done expeditiously and at minimum cost.

There will be an ornamental cornice of galvanized iron and an ornamental iron railing. The figures explain themselves. The total weights, etc., are as follows:

Plates and rivets.....	89,000 pounds.
Screw-bolts.....	1,500 "
Cast washers.....	3,200 "
Base-plate.....	22,500 "
Lead in joints.....	1,500 "
Masonry in foundation.....	93 cubic yards.
Total weight on foundation per square foot of surface, with tank empty.....	1½ gross tons.
Total weight on foundation per square foot of surface, with tank full.....	2½ "
The cost of the piling and excavation was.....	\$1,100
" " masonry.....	825
" " iron-work.....	5,675

The designing engineer was Mr. Isaac S. Cassin, of Philadelphia, and the superintendent of the works Mr. John L. Coffin.

In the erection it was intended to use an interior floating scaffold, but as this required the full pressure to be kept up in the main during the whole day, it was found to be impracticable. An internal scaffolding was used, and external hanging scaffolds, with rollers below and at top for easy moving. A permanent iron ladder on the exterior furnishes access to the top.

A TALL CHIMNEY-SHAFT.*

THIS remarkable chimney-shaft has been erected with a view to get rid of the fumes from the smelting-furnaces at the works of the Mechernich Lead-Mining Company, near Cologne, Rhenish Prussia.

The works of the company are situated in the mountains at an elevation of about 2,000 feet above sea-level, and consequently this shaft is exposed to high wind-pressures.

It has been previously stated that it is the tallest shaft in the world, but such is not the case, as there are two taller shafts in Great Britain—namely, the Townsend shaft, Port Dundas, Glasgow, and the St. Rollox shaft, Glasgow, the next in magnitude being the Mechernich shaft. For the sake of comparison the leading dimensions of the three shafts are given:

Townsend Shaft.

	Feet.	Inches.
Total height from the bottom of the foundation to the top of the coping.....	468	0
Height from the ground-line to the top of the coping.....	454	0
Outside diameter at the ground-line.....	32	0
" " " top.....	13	4
Total weight of the shaft, about 8,000 tons.		

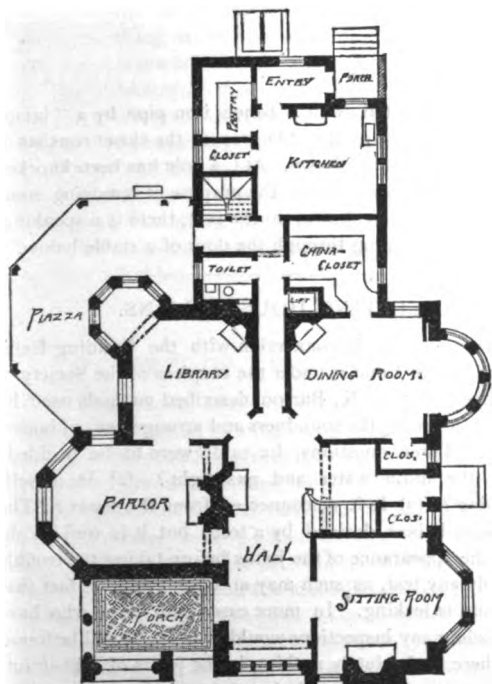
St. Rollox Shaft.

	Feet.	Inches.
Total height from the bottom of the foundation to the top of the coping.....	455	6
Height from the ground-line to the top of the coping.....	435	6
Outside diameter at the foundation.....	50	0
" " " ground-line.....	40	0
" " " top.....	13	6

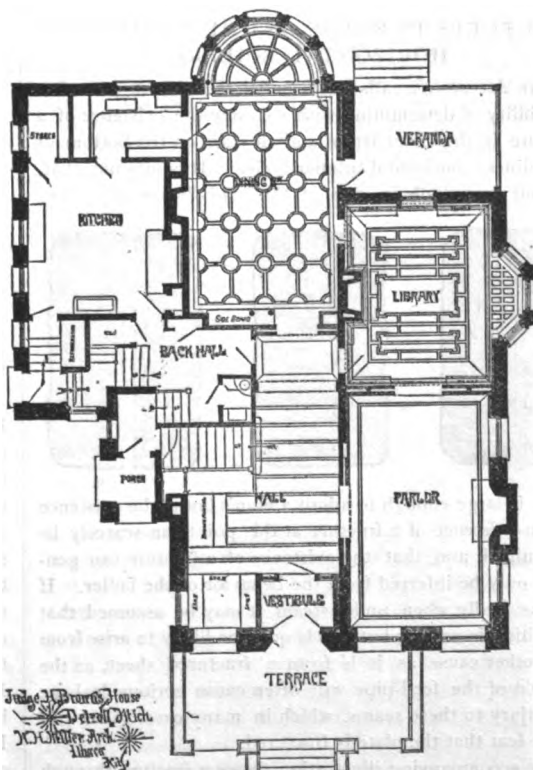
Mechernich Shaft.

	Metres.	Feet.
Total height from the bottom of the foundation to the top of the coping.....	134.6	441.8
Height from the ground-line to the top of the coping.....	131.1	430.0
Foundation 12 metres square.....	12.0	39.36
Base at ground-line 10 metres square.....	10.0	32.8

* Description of a Circular Chimney-Shaft at Mechernich, near Cologne. By John Mackworth Wood, Assoc.M.Inst.C.E., in Minutes and Proceedings of the Institute.



FIRST STORY PLAN



FIRST STORY PLAN

RESIDENCE OF E. TORREY, ESQ., DORCHESTER, MASS.—
CABOT & CHANDLER, ARCHITECTS.

Diameter at plinth, which is the point where the circular shaft commences, 10 metres (32.8 feet) from the ground-line is..... 7.5 = 24.6
Diameter at the top outside..... 3.5 = 11.48
Total weight of the shaft, 5,459 tons.

The foundations of this shaft are built on the solid rock, called hard "Graywacke," or sandstone, the foundation being constructed of dressed stone (sandstone) masonry, with sloping sides, the dimensions being 12 metres (39.36 feet) square at the bottom, and 10.4 metres (34.11 feet) square at the top, the thickness being 3.5 metres (11.48 feet). The top of this stone foundation is level with the ground-line. From this level the base of the shaft is built 10 metres (32.8 feet) square for a height of 10 metres (32.8 feet), the first 5 metres in height (16.4 feet) of the base being built with vertical sides. Again, from this level the base becomes octagonal, which finishes with a circular plinth 10 metres (32.8 feet) from the ground-line; from the plinth upwards the shaft is circular. In the base of the shaft is an opening for the smoke 5 metres (16.4 feet) in height. On each side of the base, on the side adjacent to that in which the opening is in, are built buttresses to strengthen the opening. The base, up to the circular plinth, is built entirely of bricks, 250 by 120 by 65 millimetres (9.82 by 4.71 by 2.55 inches), made from fire-clay which has been burnt in an annular kiln. The circular portion, or stalk of the shaft rising from the plinth to the top, is constructed of radial bricks of yellow clay, 250 millimetres at the longest side and 100 millimetres thick (9.82 by 3.93 inches), which have been burnt in a gas-chamber furnace.

The top of the shaft or cap is of light, ornamental design, with slight overhanging projections, the ornamental portion being built of the same bricks as the circular shaft itself. No bond-iron has been used in the shaft. The batter of the circular shaft or stalk is straight. The flue is 3.5 metres (11.48 feet) in diameter at the bottom of the shaft and 3 metres (9.84 feet) at the top.

The shaft from the ground-line to the top is divided into twenty-seven sections, the thickness of the walls varying from $3\frac{1}{2}$ metres (11.48 feet) in the base to 2 metres (6.56 feet) at the commencement of the circular shaft, and again to 0.25 metre (0.82 foot) at the top of the shaft.

	Metres in Height.	Feet in Height.	Thickness of Wall in Metres.	Thickness of Wall in Feet.
1st section base.....	10.00	32.80	3.75	12.30
2d ".....	3.00	9.84	2.00	6.56
3d ".....	3.85	12.62	1.03	3.33
4th ".....	4.15	13.61	1.86	6.10
5th ".....	4.00	13.12	1.79	5.87
6th ".....	4.00	13.12	1.75	5.74
7th ".....	4.10	14.76	1.68	5.49
8th ".....	4.25	13.94	1.61	5.28
9th ".....	4.05	13.28	1.54	5.05
10th ".....	4.50	14.76	1.47	4.82
11th ".....	4.15	13.61	1.40	4.59
12th ".....	4.05	13.28	1.33	4.36
13th ".....	4.35	14.26	1.26	4.13
14th ".....	4.30	14.10	1.19	3.90
15th ".....	4.10	13.44	1.12	3.67
16th ".....	4.32	14.16	1.05	3.44
17th ".....	4.05	13.28	0.98	3.21
18th ".....	5.30	17.38	0.89	2.91
19th ".....	4.00	13.12	0.82	2.68
20th ".....	4.54	14.89	0.75	2.46
21st ".....	5.50	18.04	0.68	2.23
22d ".....	5.10	16.72	0.61	2.00
23d ".....	6.05	21.81	0.53	1.73
24th ".....	6.01	19.71	0.46	1.50
25th ".....	6.40	20.99	0.39	1.27
26th ".....	5.28	17.31	0.32	1.04
27th ".....	6.70	21.9 (cap)	0.25	0.82

The foundation, base, and a height of 13 metres (42.64 feet) of the circular shaft were built in the autumn of 1884, with scaffolding on the outside. The works were then stopped on account of the autumn storms. The other portion of the shaft was commenced on the 14th of April, 1885, and finished on the 19th of September in the same year. During this time the weather was very unfavorable, there being only one hundred and seven working days, in which time a height of 108.1 metres (354.56 feet) of the shaft was erected by an internal scaffold. The daily rise of the shaft was 0.6 metre to 2.0 metres (1.96 feet to 6.56 feet) according to the thickness of the wall and the state of the weather; no working day was lost to allow for the hardening of the mortar. The average number of men employed daily on the scaffold in the construction of the shaft was eight. The materials for the erection of the shaft were raised through the internal scaffold in a bucket having a capacity of one-half cubic metre (17.65 cubic feet) by a small locomotive-engine, which ran on a line of rails starting from the bottom of the shaft. The whole of the masonry and brick-work through-

out the shaft is built in lime-mortar mixed with good sharp sand, with an addition (decreasing from the bottom to the top) of 12 per cent. to 10 per cent. of Portland cement.

The internal scaffolding was of the nature of a shaft, and was carried up some 30 feet in advance of the brick-work, for the convenience of hauling up the materials and moving up the bricklayers' scaffolding as the brick-work progressed. Inside this scaffold-shaft, or framing, was the bricklayers' scaffolding, which was fixed to the scaffold-shaft, and occupied about eight men in its erection for one hour per day. Up to the present the shaft is perfectly sound, and no iron hooping has been required. The shaft is provided with an efficient lightning conductor.

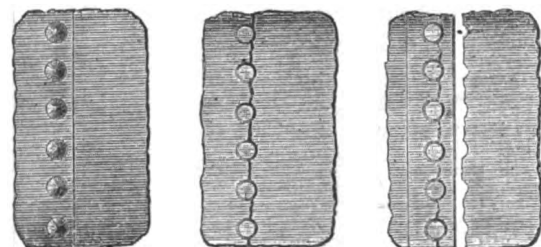
The weight of the whole structure, including the foundation, is 5,512,650 kilos (12,127,830 pounds=5,459.3 tons), and taking the area of the outside of the foundations as 146 square metres (1,570.96 square feet) (12×12 metres + 2 square metres for the projecting buttresses), the load per square metre on the rock foundation is equal to 37,757 kilos (8,306.5 pounds per square foot = 3.7 tons per square foot). The pressure per square foot at the top of the base of the stalk, where the circular work commences, is 9.61 tons. The height of shaft from the ground-line is thirteen times the diameter at the ground-line.

In calculating the stability of the shaft to resist the pressure of wind, a pressure of 783 kilos per square metre, or 160.38 pounds per square foot, has been assumed. In working out this calculation for the bed-joint at the base of the stalk, the relation of the moment of stability to the moment of pressure of wind is such that they balance about the extreme outer edge of the shaft. This leaves no factor of safety with a wind-pressure of 160.38 pounds per square foot. Notwithstanding this result, it will be seen that the shaft has ample stability when it is considered how great the wind-pressure has been assumed to be; a quantity nearly three times greater than that assumed by Professor Rankine and the English Board of Trade. The author is of opinion that had this shaft been built in England, the conditions of construction would have been somewhat different. In the first place, the mortar would have been made entirely of Portland cement, or blue-lime, not mixed together, as described. Secondly, the shaft would have been so designed that the pressure per square foot on the rock foundation would have been reduced; also, the large pressure of 9.61 tons per square foot at the bed-joint, where the circular work commences, could have been considerably lessened by increasing the size of the base, thereby increasing the stability. The author thinks that had this shaft been built with a "hollow batter," or logarithmic line, its appearance would have been improved. The vibration of the shaft at the top is small.

For a great portion of this information the author is indebted to Mr. Julius Matton, of the Mechernich Lead-Mining Company.

FRACTURES IN SEAMS ON THE BOTTOMS OF HORIZONTAL BOILERS.

THE *Locomotive* calls attention to the almost utter impossibility of determining with accuracy the existence of a fracture in the inner lap of a girth-seam on the bottom of an ordinary horizontal tubular boiler. It points out that, without a manhole in one of the heads below the tubes



which is large enough to admit a man's body, the existence or non-existence of a fracture at this point can scarcely be determined, and that the existence of a fracture can generally only be inferred from the behavior of the boiler. If it leaks badly when under steam, it may be assumed that something is wrong; but this is quite as likely to arise from some other cause as it is from a fractured sheet, as the location of the feed-pipe will often cause serious leakage and injury to these seams, which in many cases gives rise to the fear that the plate is fractured.

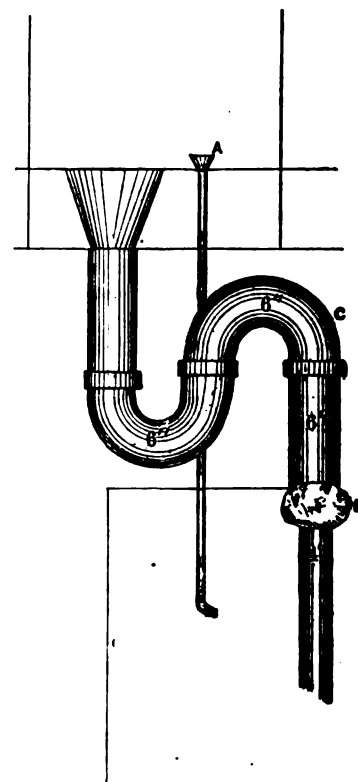
The accompanying illustration shows a fracture through the inner lap of a girth-seam of a horizontal tubular boiler,

discovered by the inspector when making his first examination of a boiler that had been proposed for insurance. The first cut of the figure shows the appearance of the seam from the outside, apparently perfect. The second portion is a view of the inside lap after being cut out, and the third shows the same with the plates separated.

We presume, though, that although our contemporary refers to the manhole in the head as a means of discovering with accuracy a crack in the inside plate of the lap, they do not lose sight of the weakness and danger caused by such a manhole, and that they allow or advise it only as a lesser evil, for they are on record as opposed to its use in all except exceptional cases, as it leaves so large a portion of the head cut away and unsupported. Presumably, the conclusion of the matter is to make the horizontal boiler of a single plate at the bottom, doing away with girth-seams and manhole, and depending on outside inspection alone, so far as cracks are concerned, and depending on the handholes for viewing the inside for deposits, erosion, or corrosion.

A NOVEL SITUATION FOR A SPEAKING-TUBE.

THE sketch herewith shows a novel situation for a speaking-tube, in connection with a plumbing job which might possibly be worse. It is communicated by a plumber at Hove, near Brighton, England. An ordinary hopper-closet is simply stuck into the end of a 6-inch soil-pipe,



which is connected with a 4-inch iron pipe by a "lump" of cement, shown at B. The trap of the closet consists of two 6-inch bends as shown. At C a hole has been knocked in the pipe, apparently for the purpose of removing some stoppage. At A as shown, on the seat, there is a speaking-tube communicating through the door of a stable below.

TESTING HOUSE-DRAINS.

AT a conference in connection with the Building Exhibition, held in London under the auspices of the Society of Architects, Mr. R. K. Burton described methods used by himself in testing the soundness and arrangement of house-drains. Three questions, he said, were to be decided: (1) Is the drain water and gas tight? (2) Is it self-cleansing? (3) Is it disconnected from the sewer? The first point is best decided by a test; but it is well to observe the appearance of the joints before taking the trouble to apply any test, as such may at once reveal the fact that the drain is leaking. In more cases than those who have not made many inspections would imagine, it will be found that there is absolutely nothing in the joints of a tile-drain. In others it will be found that there is clay only, and he had never known a clay-jointed drain to be water-tight. In still other cases it may appear, from looking at the tops of joints, that they are carefully made with cement; but when a rod of iron or a chisel is plunged into the earth

underneath them, it comes up wet and black with sewage. It is only when none of the appearances described are to be seen that it is worth while applying a test. The best undoubtedly is the water-test. In this the drain is opened by the removal of a pipe, and is plugged.

It will be found impossible to fill more than perhaps about one out of three drains, except in houses which have been very recently remodeled, and that it is necessary to avoid pouring too much water into a leaky drain. If the drain does fill up the running water is stopped, and it is observed whether the water in the gullies or surface-traps remains at a constant level. The test next in efficiency to that by water is the smoke-test. The next question is as to whether the drains are self-cleansing or not. As in the case of the water-test, an opening must be made; but it is not needful to remove a whole pipe. It is sufficient to chip a round hole in the top of one. If no deposit appears just under the opening, water is allowed to run into the drain at the upper end, and the flow is observed at the opening. If the water runs briskly and clear past the opening all is right. If, however, it comes tardily, and carrying deposit with it, it is a question of ascertaining the cause. A drain, if well laid, should, with a fall of one in sixty, clear itself. A house-drain should seldom or never be larger than six inches; four inches is large enough for very small houses, and if five inches were the size generally made, it would probably be better than either four inches or six inches for the majority of houses. Now as to whether the drain is disconnected from the sewer or not. To make absolutely sure whether or not there is a concealed trap on the drain, if the opening does not reveal this, the only plan is to pass rods down the drain. One may, however, have evidence approaching to certainty by burning a match in the drain, and observing whether or not there is any current of air through it. If there is, it may be assumed that there is no trap on the drain. It is necessary to test each branch for self-cleansing properties. The material of soil-pipes should be ascertained by removing the wooden casings which generally cover them. If an internal soil-pipe is made up of light cast-iron pipes (rain-water pipes), and lead junction-pieces for the closets, it may be condemned without any further investigation. The best test for a whole-drainage system is undoubtedly the smoke-test. This test consists essentially in filling the drainage system with smoke at some pressure, and observing whether or not it issues at any place other than the openings intended for ventilation.

Smoke-rockets are now largely used by those who have to make inspection of sanitary arrangements. These consist of paper cases filled with a composition which gives off a vast quantity of smoke at a considerable pressure. The smoke-test can never be taken—when it gives negative results—as an absolute test for drains. The peppermint-test was inferior to the smoke-test when this latter is properly applied, in the speaker's opinion. The next thing of most importance to do is to trace the overflow-pipes of the cistern to see whether these are connected with the drain or not. A connection of any kind between a cistern and the drain is a thing to be condemned. The baths, sinks, basins, etc., come next under examination. The discharge-pipe—and overflow, if there be one—of each of these must be traced to discover whether or not it is connected with the drain. The closets must be very carefully examined, although they are not nearly so often the points of ingress of sewer-gas to the house as any other appliances, such as sinks. They are often, however—especially when of the old pan form—themselves generators of foul gases, and as such objectionable.

EFFECT OF WIND ON TRAPS.

THE *Plumber and Decorator* cites a case where the seals of traps were affected by a high wind. The house in question was two stories high, with a basement; the horizontal soil-pipe was about thirty feet long from a running-trap to where is joined the vertical soil-pipe, which was forty-five feet high, carried well up above the ridge of the roof and about ten feet distant from it. On the basement, the first and the second floors were the usual fixtures, each with its own branch from the soil-pipe. The fresh-air inlet was two inches, the soil-pipe four inches, open at the top. The closet has a short hopper, and most of the traps were S-traps, with 5-inch seals and no vents. Although the discharge of any fixture in the house has scarcely any effect on the seal of the traps of any other fixture, yet the wind caused a fluctuation of nearly $1\frac{1}{4}$ inches. There was no more wind than might occur occasionally in an ordinary

season. The observer purposes to try the effect of ventilating-caps to see if they will prevent the fluctuation of water in the traps caused by wind.

[A similar case was brought to our notice some years ago by a correspondent living at Roxbury, Mass. In this case the soil-pipe extended above the roof, but there was no air-inlet on the house-drain. When the wind was blowing strong the seals of the traps in the bath-room were disturbed, and an experiment showed that the air in the soil-pipe was rarified, producing a suction tending to break the trap-seals. In this case the want of an air-inlet seemed to be the cause. In the English case the air-inlet was probably too small when the great length of soil-pipe was taken into consideration.]

PLUMBING APPRENTICESHIP QUESTION IN NEW YORK.

AS WE go to press there is expectation in some quarters that during the week a contest will take place between the Journeymen Plumbers' Association and Master Plumbers, of this city, on the apprenticeship question. The journeymen are reticent, and the master plumbers seem to be waiting for developments.

Correspondence.

A COMBINATION SEWAGE AND DRINKING-WATER TANK.

BEATRICE, NEB., August 14, 1886.

SIR: It appears the proper thing to report through the columns of your journal dangerous errors made in plumbing-work. As a specimen of an architect's stupidity in a plumbing specification, I quote the following from the specifications of a public building erected in Kansas a short time ago.

A portion relating to the drainage was to gather all of the waste-pipes from the different fixtures in the building (including water-closets, urinals, and wash-basins) to the basement. Sewer-pipes laid in the basement to receive the wastes and to conduct same to cistern outside of building. Same sewer to receive rain-water from the roof. Also, specified to build a tank to supply house, locating same on upper floor, to be supplied with water from the above-mentioned cistern. The above is a fair sample of the entire specification. What do you think of it? PLUMBER.

[In all probability the so-called architect who was responsible for this stupidly dangerous specification is no more entitled to be considered an architect than many men who pretend to do plumbing-work are entitled to be considered plumbers.]

BOOKS ON MATHEMATICS—CAPACITY OF TANKS—DISCOUNTS.

BOSTON, August 23, 1886.

SIR: Being a young man growing up in the plumbers' business, and desirous of learning all that would be of benefit to me in it, I have received S. S. Hellyer's *Plumbing Problems*, and I read THE SANITARY ENGINEER every week. Not being as well versed in mathematics as I would like to, you will please let me have the name of the best book you know of on the subject. Please let me know how to get the capacity of round tanks, boilers, etc.; also, the best way to get results of discount on stock. What is the price of Haswell's *Mechanics' Book*? Yours, N.

[We should advise our correspondent to get the arithmetic used in Boston schools. There is no work which covers the range of the higher mathematics, and we think the information our correspondent needs will be found in the arithmetic.]

If the boiler or tank has flat top and bottom, multiply the diameter in inches by itself. Then multiply the product by .7854, and this product by the height in inches. The result will be the capacity in cubic inches. Divide this by 231, and the result will be the number of U. S. gallons.

Thus, suppose you have a round tank 15 inches in diameter and 4 feet (48 inches) high. Multiply 15 by itself, and you get $15 \times 15 = 225$. Multiply 225 by .7854 and you have 176.715. Then $176.715 \times 48 = 8,482.32$ cubic inches. Now divide by 231, and the answer is 36.7 gallons for the capacity of the tank.

To find the price after discount is deducted, subtract the per cent. of discount from one dollar, and then multiply the gross price by the difference. The result will be the price less the discount.

Thus, if your bill is \$65, with 25 per cent. discount, subtract 25 cents from one dollar. This leaves 0.75 cents.

Multiply 65 by 0.75, and the answer is \$48.75, which is the net price of the goods.

The price of Haswell is \$4. It will be sent by the Book Department on receipt of this price, postage free.]

PRESSURES PER SQUARE INCH.

QUEBEC, August 17, 1886.

SIR: Would you kindly inform me through the columns of your valuable paper, THE SANITARY ENGINEER, of the meaning of the term, pressure per square inch? I saw an advertisement in a paper stating that the liquid glue advertised was tested to over 1,600 pounds to square inch. What does that mean?

Also, how is boiler pressure per square inch calculated? If it is not too much trouble, you will greatly oblige, AN APPRENTICE.

[Pressure per square inch means that on every square inch of surface of the vessel or substance to which reference is made there is a pressure or force exerted equal to the number of pounds named. Thus 100 pounds pressure per square inch on a steam-boiler means that on every square inch of the shell of the boiler there is a pressure of 100 pounds. This pressure in a boiler is indicated by the gauge. Whatever the gauge reads is the pressure per square inch. In the case of the glue, we presume the advertisement meant that when two pieces of wood were glued together, it would take over 1,600 pounds for every square inch of surface glued to break the joint apart. Thus, if two pieces of wood two inches on a side, or four square inches in all, were glued together, it would take 6,400 pounds and more to break them apart.]

Gas and Electricity.

Illuminating Power of Gas in New York City.

Week ending	New York Gas-Light Company.	Manhattan Gas-Light Company.	Metropolitan Gas-Light Company.	Mutual Gas-Light Company.	Municipal Gas-Light Company.	Kitcherbocker Gas-Light Company.	Equitable Gas-Light Company.
August 28.....	25.27	21.17	21.32	30.84	27.73	22.30	31.28

E. G. LOVE, Ph.D., Gas Examiner.

THE LIGHTING OF THE ROYAL AQUARIUM, WESTMINSTER.

THE installation consists of 23 Gölcher arc-lamps, distributed as follows: Seven 3,000 candle-power arc-lamps of the indoor type suspended by the company's improved raising and lowering apparatus in the interior of the main building; six 2,000 candle-power arc-lamps of a similar type in the new dining-hall; three 2,000 candle-power arc-lamps light the diving and swimming departments, and seven 2,000 candle-power arc-lamps, with weather protectors and iron reflectors outside, three being placed at the front of the building, and four along the side. Messrs. Bertram and Roberts' dining-rooms are lighted by seventeen 20 candle-power incandescent lamps, eight being placed over the dining-tables, three in the large private dining-room, and two in the small room, the balance being in the managers' office, etc. The working current is obtained from three No. 4 Gölcher dynamo machines placed in an engine-house, to which persons desirous of obtaining information of the installation can have access. The current is led to switches so that any part of the installation can be lighted as desired.

Suitable measuring instruments are also connected to the machines so that at any moment the attendant in charge can read either the amount of current flowing through any circuit or the e.m.f. at the terminals of either of the three dynamos.

The motive power is one of Messrs. Roby's 16 horse-power engines.

MANUFACTURE OF OIL FROM WOOD IN SWEDEN.

A NEW industry has lately sprung up in Sweden, and promises shortly to become a most important one. Oil for illuminating purposes is now manufactured in that country from the stumps and roots that remain in the forests after the timber has been cut. These are subjected to a process of dry distillation, and besides wood-oil, many other products are obtained, amongst which turpentine, creosote, acetic acid, wood-charcoal, tar-oils, etc. This oil cannot be used in ordinary lamps, as containing a large proportion of carbon it gives off a great deal of smoke during combustion. When mixed with benzine, however, it may

be used in ordinary benzine lamps; but when burnt alone, a special lamp must be adopted. The trees that furnish the greatest amount of oil are the pine and fir. There are now about forty establishments engaged in this manufacture in Sweden.—*Society of Arts Journal*.

THE *Electrician* of London does not look with favor upon the plans adopted by the New York Underground Wire Commission for burying electric wires. It thinks a better plan would be to let the several companies concerned do "their own work in their own way, subject only to supervision in the interests of public safety." The companies interested have had abundant time to bury their wires in their own way, and they have not done it. It looks as though some of them never had any idea of complying with the law in this regard. Our contemporary further states that "in New York and Chicago notably electric wires of every description have disappeared or are rapidly disappearing underground." So far as this city is concerned the wires overhead appear to be as thick as ever.

THE gas accounts of the Manchester, Eng., Corporation for the year ending March 31, 1886, show that 2,890,917,000 cubic feet of gas were sent out from the works during the year, of which 610,272,000 cubic feet were sent out in the day time. The leakage amounted to 7.69 per cent. The average illuminating power was 19.41 candles.

Electrician says: "It is reckoned that there are now in Paris 16,044 incandescent lamps, and 2,225 arc or Jabloch-koff lights." It quotes from another journal to the effect that these lamps represent in round numbers 38,300 gas-burners lost to the Paris Gas Company, and in revenue something like two and one-third million francs.

THE manufacture and supply of gas in Glasgow has been in the hands of the Corporation since 1869. From a summary of the annual accounts, given by the *Journal of Gas-Lighting*, it appears that during the past seventeen years the capacity of the works has been increased from 6,000,000 to 21,000,000 cubic feet of gas per twenty-four hours. The price has been reduced from 4s. 7d. to 3s. per 1,000 cubic feet. The average illuminating power for the year 1869-70 was 28.2 candles, and down to the close of the year 1884-85 the average was never below 26 candles. The average for the past year was 25.71 candles. The leakage or unaccounted-for gas has decreased from 20.8 per cent. in the first year to 10.6 per cent. in 1884-85, and 11.3 per cent. in 1885-86. In 1869-70 the quantity of gas sold was 1,026,324,000 cubic feet, while during the past year it amounted to 2,166,179,000 feet. The lowest rate of increase was 2.3 per cent. during the past year, whereas the maximum increase was nearly 10 per cent.

THE following figures are from the accounts of the Gas-Light and Coke Company and the South Metropolitan Gas Company, of London, for the half-year ending June 30, 1886:

	Gas Light and Coke Company.	South Metropolitan Gas Company.
Coal carbonized, tons		
Common.....	841,710	259,615
Cannel.....	18,750	1,438
Gas made, thousands	8,609,869	2,622,080
Common.....	335,976	
Cannel.....	8,007,945	2,535,368
Gas sold and accounted for, thousands	313,444	
Number of public lamps	46,928	16,675
RESIDUALS:		
Coke, chaldrons.....	1,022,135	
" cwt.....		3,256,851
Breeze, chaldrons.....	110,092	
" yards.....		37,267
Tar, gallons.....	9,433,454	2,625,231
Ammoniacal liquor, butts.....	257,957	85,116

Novelties.

Under this heading we propose to describe and illustrate appliances of probable interest to our several classes of readers. The selection will be made without reference to the wishes of agents or patentees, being governed solely by considerations of novelty, ingenuity, and probable interest to readers, and especially the fact that they have not been elsewhere described. As a rule we shall make no comments, and it is to be distinctly understood that a notice does not imply approval. No charge will be made for these notices, and any offer of pay for their insertion will insure their omission. We shall be glad to have our attention called to novelties suitable for this section.

FUEL-MAGAZINE FOR HORIZONTAL BOILER.

THE accompanying drawings show a novel arrangement of coal-magazine as applied to horizontal boilers, lately patented by John T. Corbett, of Aurora, Ill.

Figure 1 is a cross-section through the boiler, its magazines, and fire-pot. Figure 2 is a vertical longitudinal section through a return-tube boiler, although the magazines may be applied to any externally-fired horizontal boiler.

The magazines may be single or double, as shown, and

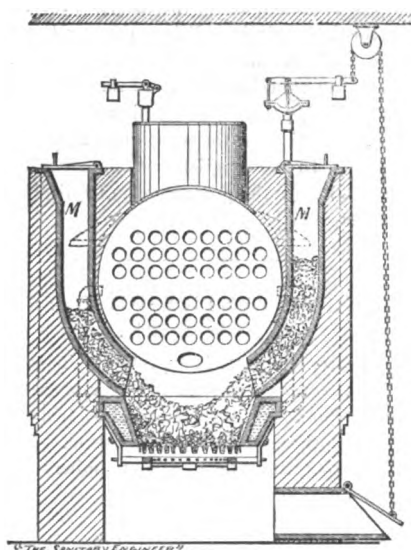


FIG-1

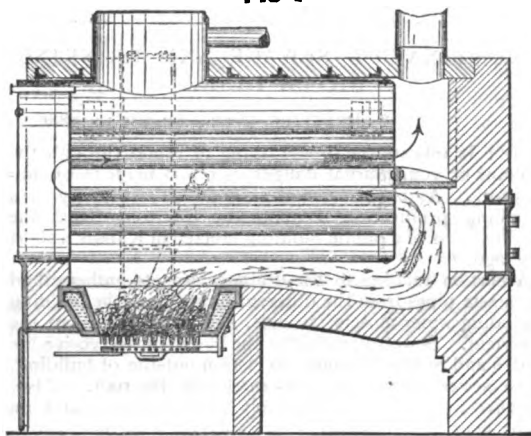


FIG-2

they are made of cast-iron and supported in the brick-work, with their lower ends terminating at the edge of the fire-pot.

They are particularly intended for heating purposes where it is desirable to keep fires for long periods without attention; but they may be used for other purposes if desired.

A water-circulating fire-pot can be used in connection with them, as shown, to avoid the formation of clinkers on the sides.

The dotted lines on the drawings show the connections between boiler and fire-pot.

STEAM-COOKING UTENSIL.

THE accompanying Figs. 1 and 2 are side-elevation and front-section of a novel steam stew-pan, whose pipes are so connected and arranged as to admit of the pan being tilted from the horizontal position in order that the cooked contents of the pan can be poured into another vessel. It is the invention of Mr. John Farrell, of St. Louis, Mo., and in detail is a pan of brass or suitable metal

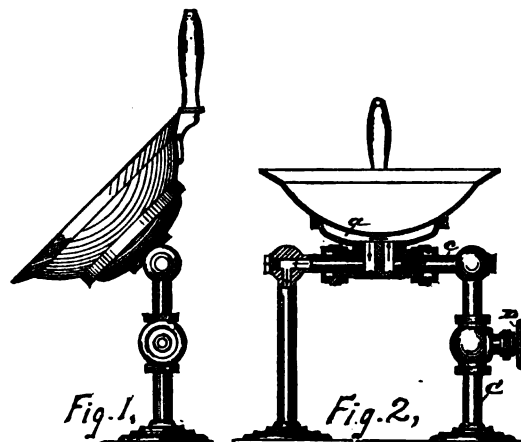


Fig. 1.

Fig. 2.

with a jacketed space, *a*, formed by screwing a bottom plate into a flange, formed by the bottom of the pan. Into the bottom is screwed a special fitting with a steam and water-way. This pivots on the steam-pipe *C* and its counter-pipe for taking away the water of condensation. A steam-standard, *C*, and its valve, *D*, are screwed to a table with a corresponding standard, through which the water runs

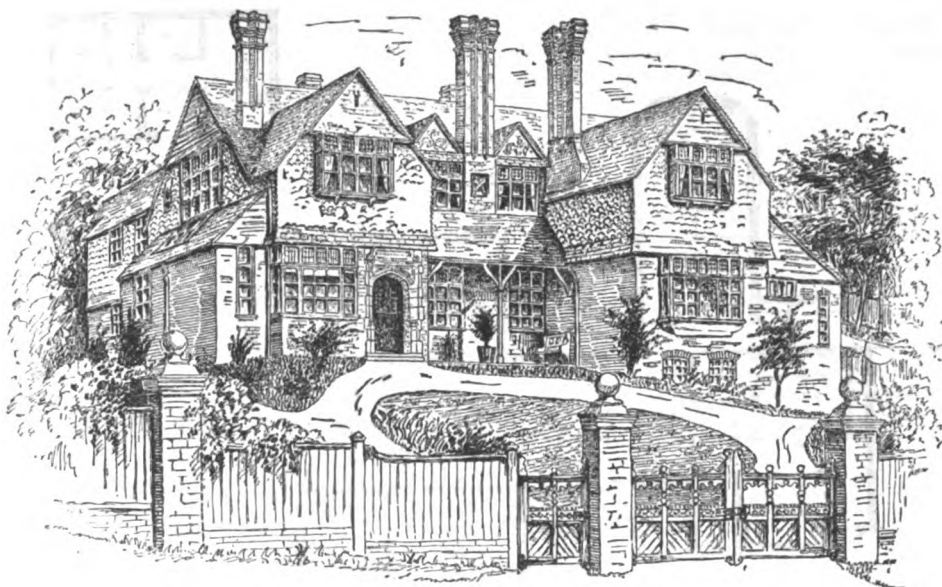
off. The steam and return pipes connect with the bottom of these standards. Further details can be observed by a study of the figures. Its application is obvious.

THE DESTRUCTION AND THE PRESERVATION OF LIFE.

AT the annual dinner of the Association of Public Sanitary Inspectors, in London, some time since, Mr. Edwin Chadwick, C. B., made some striking remarks on the extent to which, on the one hand, sanitary science has lessened death-rates, and, on the other, the cost and waste of the large armaments of European nations have hindered sanitary undertakings. He entitled his address "Sanitation *versus* Militarism," and we give an abstract here:

"I have recently addressed you on the deplorable cost in life and money by the delay of sanitary legislation incurred by political preoccupations which, as was anticipated, have proved to be fruitless. While we are under further delay of legislation it may be advisable that we should consider our normal standards of sanitation for the future application of their principles. We may strengthen our principles by considering and revising our results. These are all sound. Take, for example, our prisons, once the chief seats of pestilences, now by sanitation with the means of water-carriage and cleanliness in every cell the seats of the highest health. So with our district half-time pauper schools in which the 'children's diseases' are almost banished, where typhus, by which they were once dreadfully ravaged, is now unknown, and in one of which (Anerley) with some 900 children there has not been a case of measles for the last twelve years. In these institutions those who enter without developed diseases upon them show a death-rate, although they are the children of the lowest type, less than one-third of the death-rate amongst the children of the general population, to whom the principles may be eventually applied. In extension of facts bearing on these results, urban districts should be examined and studied as norms where the separate system of drainage has been duly applied, where by correct sanitation foul smells are cleared from the houses and from the streets, and from the fields, where fresh and undecomposed sewage is duly applied with a five-fold production, and where the death-rates have been reduced by one-third, and in some instances by one-half, what they previously were. Such normal examples should be kept in view and studied, though for the present they are shut out by the prevalence of sinister interests in regard to expense, or by preoccupation with inferior political questions. To the normal results we may add the norms of the preventive service which show how sanitation has half-emptied military hospitals which curative science, unaided by sanitary science, kept full, with augmentation of force and economy by the reduction of the army death-rates by two-thirds of what they formerly were. * * * Let us by contrast look abroad at the working of the bad economical conditions which reduce health and life and strength. Let us look at Italy. Two millions of money were voted for the relief of Naples, by sanitation, from the dire visitation of the cholera. But there was a deficit in the treasury, and the Government had not the money to give. The deficit was due to the enormous expenses of *militarism*—to bloated armaments, and to a fleet of big war-ships, some of which ships must have cost, as ours have done, a million of money each. * * * It may be of use to give an estimate of the civil life and force that may be gained to sanitation by the application of a million of money—the cost of one big ship—if the sum were spent on sanitation. In the towns where the works were properly carried by contracts by our instructions under the Public Health Act, on the separate system, the cost was a penny a week for bringing a constant supply to the door, a penny halfpenny per week for the internal distributory apparatus, including the water-closet and kitchen-sink and the self-cleansing house-drains, and a penny a week for self-cleansing sewers, or 15s. per annum. Since the time of our works on the separate system the price of labor in England has been raised by a third. But the cost of the chief materials has been reduced by about one-half, so that the estimates I have cited would for England stand very much as they were. The expenditure of a million at five per cent., the cost of the big ship, would at this rate be equal to the sanitation of 66,666 houses, or, at five inhabitants per house (the suburban average with us), it would serve for 333,333 inhabitants. Suppose the expenditure effected a reduction of the death-rate by only five per 1,000 (and on the average of the towns under the separate system is in its use nine per 1,000), the saving of life would be 1,667 per annum. But to each

case of death there are at the least twenty cases of bed-lying sickness of adults, so that there would be a total annual saving of at least 33,330 cases of sickness for each big ship. For the decade the saving would be of 16,667 lives and 333,333 cases of sickness. And be it noted that this accumulation of civil life and force and economy goes on during all the long intervals of peace, while in militarism waste goes on from the deterioration of the appliances of war and the progress of inventions. The money wasted by the Italian Government on two big war-ships would, I estimate, have sufficed to advanced the health of the population of Naples up to the normal in its grand and superior climate. The sanitation of Paris is now delayed by the deficit in the municipal funds, and the general Budget of the Republic, and that delay is due to the wasteful expenses of its big and, for defensive purposes, wasteful armaments. I have had means of estimating the losses of France by militarism in Algeria, where the needless fortifications of internal towns would have sufficed to put each town in good sanitary condition, have fitted them as seats of emigrants, and have given strength as well as revenue. The evident waste by militarism in Algeria since its occupation by France would have sufficed to have put all the cities and towns of France in a position that in seven years would replace with a stronger and better population all that France has lost by the cession of Alsace and Lorraine, and would also by the extensive preservation of infant life check the relative depression of the progress of the population of France. Full two-thirds of the force in Algeria is a dire waste by militarism at the expense of the most poor and depressed population of France. The sanitary service has been and is similarly kept out of sight by the omission of due recognition here. A year's cost of keeping each soldier unproductively in camp or cantonment would serve to drain one hectare or two acres of the marshy or waterlogged land so extensive in France. M. Maurice Block, of the Institut, reckoned the loss of productive labor occasioned there by the conscription at one hundred and thirty-two millions of days annually estimated at two francs a day. * * * One of the most able sanitary engineers of our service, in the army sanitary commission of the Crimea, declared to me, as he was well competent to do, that if the money spent by Russian militarism in the fortification of Sebastopol had been applied in opening up the fine territory thereabouts with roads and such sanitary works as would fit it for settlement, an amount of civil population and of force would have been raised there that would have withstood the combined armies of France and England which the fortifications failed to do. Russia judged by its army (where the death-rate is three times greater and heavier, and the loss of force greater than the death-rate of the German army)—appears to be the heaviest death-rated State of all Europe. Towns and villages are destitute of any sanitary provision whatsoever, and are immense cesspits of putridity, with waste of manure, while in their wretched fields, according to Lady Verney, the produce is only from two and a half to four and a half of the seed sown, instead of fifteen to twenty, as in England. Yet they had one sanitary norma from our first Board of Health. At each visitation of Asiatic cholera St. Petersburg was ravaged with a loss of twenty thousand people killed, until, as a physician of the Czar informed the Sanitary Congress in Holland, they heard of the preventive course taken by our first general Board of Health, and adopted the same, with the result of decreasing the death-rate to one-fourth of what it had previously been. But there has been no recognition or extension of this example. The application of English capital was invited for improvements of the Russian cities, and one of the first water-works and sanitary works in Europe was provided by an English company, completed by my son, but the promised payment has not been forthcoming, and English capitalists are warned against further schemes. Wheresoever we see a heavily death-rated State we see a State where the sanitary condition of the population is neglected, and we see a troubled and insecure State, and that is the condition of Russia beyond any other State in Europe, where occupation is provided for its excessive army by continued threatened troubles, and where repression by the excessive military force generates and maintains expense. Look, again, at the defenceless condition, from want of sanitary knowledge, of the poor people of Spain as shown in the last attack of cholera, when more human beings fell than in the great Peninsular War. Yet, untaught by that terrible experience, I read only this week of a Spanish admiral proposing an expenditure of eleven millions of money on new war-ships, which, on our reckon-



NORWOOD COTTAGE HOSPITAL

ing, would save for a decade 183,335 lives and 3,666,667 cases of sickness. The proposed cost of this fleet expended in sanitation would save in a decade more than a thousand lives and forty thousand cases of sickness of adult laborers, and more than half the ordinary insurance charges against excessive sickness and mortality. Germany, it is reported, has by the application of sanitary science reduced the army death-rate to five per 1,000 annually—that is to say, to less than one-half of the death-rate prevalent among the civil population of the same ages. By this reduction, and by physical training, during a short service, it augments the aptitude and productive power of the men for civil service. It is considered that such economy might be effected without so much long barrack detention. Indeed, we have shown that the largest proportion of military exercises may be beneficially transferred from the productive adult stages to the less productive juvenile stages and almost to the infantile stages of life. However, by the application of sanitary science Germany has gained during little more than a decade as much life and force as was lost during the Franco-German war. Professor Sormani, of Pavia, has shown us by an analysis of the death-rates of the armies of Europe the progress of our science. With us it is, of the home army, 8 in 1,000 (it was once 17). In France it is 10 in 1,000; in Austria and Italy it is as much as 11½, but in Russia it is more than 16 per 1,000. In the Indian army we have obtained a reduction from the old death-rate of 69 to less than 12 in 1,000. During the last decade, when the reduction had been got down to 20 in 1,000 a gain of 40,000 of force, first to last, had been achieved, and a gain of six millions of money."

COTTAGE (SMALL) HOSPITAL CONSTRUCTION.

BY HENRY C. BURDETT.

Author of Cottage Hospitals, Pay Hospitals of the World, etc.

No. VIII.*

NORWOOD COTTAGE HOSPITAL.

THIS hospital presents a pleasing appearance from the outside—a point of some importance, no doubt, but one which must not be allowed to interfere with the purpose to which the building is intended to be devoted. It will be seen that the dormer windows, though picturesque, with quaint gables and other decorations to be met with in English domestic sixteenth-century work, and effective to the eye, render the first-floor rooms of such a building unsuitable for hospital wards. The plan, however, is worth reproducing, not only to show what mistakes to avoid, but also as a type of ward construction, by which the beds are placed on one side of the ward only, and not on both, as is usual in large hospitals. It is becoming increasingly the fashion among architects in England to adopt this comparatively narrow and elongated form of ward in cottage hospital buildings. For my own part, I think there are grave objections to it, on the grounds of appearance, free circulation of air, administration, convenience, and comfort. A narrow ward is never wholly satisfactory, and so is best avoided.

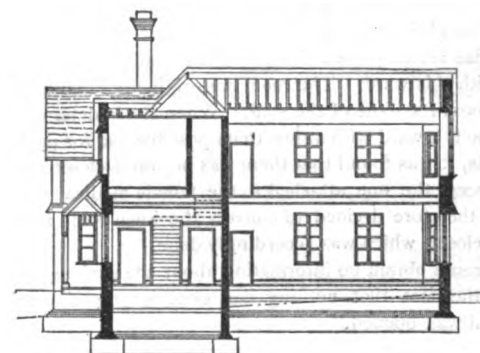
* No. VII., the Cottage Hospital at Llandudno, was illustrated in our issue of June 24, 1886.

NOTES OF A VISIT TO THE NORWOOD COTTAGE HOSPITAL, MAY 1, 1884.

"Exterior of building picturesque, simple but effective, treatment of English domestic sixteenth-century work. Red tile roofs broken up with gables and dormers, red tile weather tiling and red brick walls. Ground slopes well away from building.

"Inside, cheery and bright appearance obtained by well-chosen tints and free use of white paint. Ample light.

"The day-room is a large and very cheerful apartment, but serves as passage-room to all wards, bath-room, and operating-room. In fact, no communication can be had between the outside or the kitchen or the operating-room and the other parts of the building without crossing some part of the day-room. Supposing, for instance, a patient from one of the upper wards has to be taken to the operating-room, he or she must be taken down stairs into the day-room before the operating-rooms can be reached. Again, suppose in one of the wards a death takes place in the morning. In such small wards as these it would be most objectionable to keep the body in the ward all day in order to remove it under cover of night. It would, therefore, have to be carried through some portion of the day-room in order to reach the mortuary.

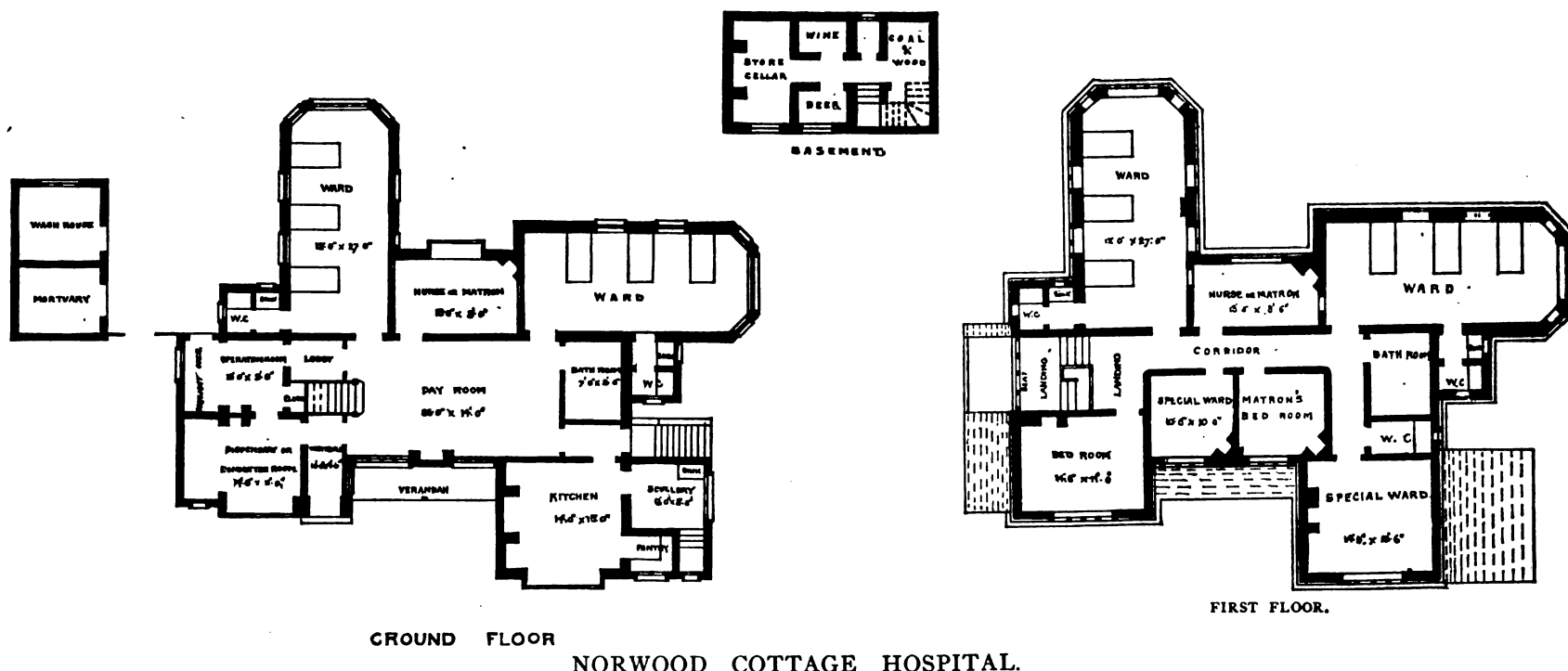


SECTION.

"The ground-floor wards are for surgical cases, male and female. This class of cases consists chiefly of fractures, the results of accidents. The wards give a floor-space of 108.0, and a cubic space of 1,107 per bed. Neither of these dimensions are sufficient for such small wards as these, more especially as the cross-ventilation extends only to about half the length of the ward. The width is too small for the working requirements of the ward, and it does not appear to be possible to change the air of the ward with sufficient frequency to insure sweetness under all conditions. The floors are of ordinary deal boards, but have so shrunk that there are wide crevices between them. This cannot fail to be a source of the most serious mischief in the future if not remedied. The wards are warmed by small iron stoves standing out in the room curtailing the already too confined width, and having a by no means pleasing appearance. They are said to answer well as regards heating powers.

"The closets attached to the wards are approached through lobbies ventilated only on one side, in each of which is a glazed stoneware sink for washing bed-pans.

"The lobby is very confined, and the position of the sink bad.



NORWOOD COTTAGE HOSPITAL.

"The kitchen offices are somewhat small, but are well lighted and conveniently placed.

"The operating-room is small, but well lighted, and convenient for its purpose.

"Upstairs the wards are devoted to medical cases. The large wards are partly in the roof, and the heads of the windows are three feet below the ceiling. The objections to the ventilation of the ground-floor wards apply here with greater force on account of the numerous angles and the great height of the ceiling above the window-heads. The same objectionable arrangements of water-closets are repeated on this floor.

"Of the two small rooms in the front, one is the matron's bedroom, the other is a special ward. This room is ten feet square, with one angle cut off by the fire-place, thus reducing its area to less than 100 feet. It has a sloping roof which starts at a height of about six feet from the floor, so that the cubic space cannot be much more than about 900 feet; and this for a special ward with no other means of ventilation than a window and a fire-place both on the same wall!

"The other special ward is altogether better as regards area, though it is partly in the roof, but a remarkable thing has recently been done by the committee in connection with this ward. The room was originally intended for a bedroom for some of the staff. When it was determined to make it a ward with a view to its possible use for paying patients, it was found that there was no water-closet available except the one attached to the female medical ward. It was therefore decided to convert the linen-room into a water-closet, which was accordingly done.

"I could obtain no information about the drainage, beyond the fact that nothing has gone wrong since the hospital was opened."

GENERAL JOHN NEWTON.

GENERAL NEWTON, who was last week appointed to the office of Commissioner of Public Works of New York while holding the position of Chief of Engineers, U. S. A., was born at Culpeper, Va., in 1823. In 1842 he graduated from West Point, ranking second in his class, and was appointed a lieutenant of engineers. He saw service in the war with Mexico, and at the outbreak of the rebellion was holding the rank of Captain in the regular army, was engaged on the fortifications around Washington and made a Major, and in the fall of 1861 was brevetted Brigadier-General of Volunteers. He was in the battle of Gaines's Mills, in McClellan's campaign on the Peninsula, fought at Antietam, after which battle he was brevetted Lieutenant-Colonel in the regular army, and commanded a division at Gettysburg. After this fight he was brevetted Colonel in the regular army and made Major-General of Volunteers. Since the war General Newton has been engaged on the improvement of harbors of Lake Champlain and of New York. His work on the latter, including operations at Hallet's Point and Flood Rock, have given him a world-wide reputation. These latter operations, which were unique in the extent of excavation necessary and amount of explosives used, were carried out on plans suggested by

General Newton to the Secretary of War seventeen years ago.

For once an appointment to the Department of Public Works, with its great political patronage and powers of enormous abuse, has been received with favor by the press and public.

FALSE REPORTS OF POISONING.

AS USUAL (says *The American Grocer*) during midsummer we have an epidemic of cases reported of alleged poisoning from the use of canned corned beef, lobster, and other articles subject to rapid decomposition when left exposed for twelve hours or longer to a high temperature. As illustrative of these we have two of recent date. The following was taken from the *New York World* of August 3:

"MADISON, CONN., August 2.—Henry Broad and his wife, of North Madison, and Mrs. Smith, of Brooklyn, N. Y., who is visiting them, were taken violently ill Sunday after eating a breakfast of canned corned beef. The children did not eat any of the beef, and were not ill at all. To-night the sick ones were much worse and are liable to die."

In reply to our inquiry we received the following:

"NORTH MADISON, CONN., August 11, 1886.

"In reply to your note, I would say we were sorry such an erroneous account of our sickness found its way to the *New York World*. We were not poisoned. The can of corned beef was opened on a Thursday and found perfectly good. We made hash of it and enjoyed it. What made us so sick was eating on Saturday just a little of what was left—the second day after the can was opened. It must have become spoiled and so upset us. We were taken sick about 10 A. M. Saturday, and at 4 P. M., instead of being worse and likely to die, as the paper put it, the worst was over and we were able to come down-stairs, although we felt pretty slim until we had a good night's rest.

"Respectfully, MRS. W. K. SMITH."

THE PATERSON CASE.

In the daily papers of the 13th inst., it was reported that Mrs. Thomas A. Morrell and five children, residing in Paterson, N. J., were poisoned by eating corned beef tainted with the metal in which it had been packed. The statement was also made that, "an examination of the can showed that the action of the meat had produced salt of tin, from which the poisoning resulted." This case was investigated by Dr. William K. Newton, Health Officer, who reports to us as follows:

"I found that the can was first opened on Friday night and that the family all ate of the meat and noticed no ill effect. The meat that remained from the meal was left in the can and then stood in an annex to the building, where it was exposed to the heated atmosphere for about twelve hours—that is, till the next morning, when the family had the meat for breakfast, and all ate of it except the father. He alone remained well. Now, this warrants the opinion that some putrefactive change had taken place between 6 P. M. on Friday and 6 A. M. on Saturday. This change might not be enough to notice by the senses, but it is a

well-known fact that a poison is sometimes generated in meat, milk, and cheese without the production of any foul odor.

"An examination of the interior of the can made it evident that the meat had not been thoroughly preserved and that possibly the can was not completely air-tight. The amount of rust that was found on the interior showed that corrosion of the metal had taken place, for the iron had rusted in many places. This showed that air had been admitted, for the amount of oxidation present could not have taken place in a perfectly hermetically sealed vessel.

"Cases of poisoning or illness from canned goods are very rare. It is probable that there are tons of various kinds of canned meat, such as beef, chicken, ham, etc., sold and consumed in the United States during the year, and it is very rarely that we hear of cases of sickness caused by eating them, and in these days, when the reporter is everywhere and hears everything, it is certain that if cases do occur we would hear of them. I am in a position in the service of the State Board of Health to hear of nearly all cases that occur in New Jersey, and during the past six years only four cases were brought to my attention. One case of sickness was due to canned corned beef, two to canned fruit, and the fourth is this case here in town. The symptoms course, and cause of the canned corned beef case was like the one here in Paterson. The two cases due to fruit were caused by corrosion, because the acid fruit was left in the tins for a long time."

The *Paterson Daily Guardian*, in commenting upon the case as reported by the Health Officer, very truthfully says:

"Canned goods are about as healthy as any other sort of food, and we are glad to be assured that such is the case, for they stand foremost among the luxuries and comforts of the present age. Formerly only millionaires and monarchs could have fruits and vegetables out of season, at enormous expense; now they are within the reach of the poorest workingman. They are one of the great comforts and pleasures of the age, and, considering the quantity consumed, as Dr. Newton says, the small number of instances of ill effects shows that this class of food is about as safe and healthy as anything else."

If the press would exercise care and examine into the cases reported, avoid sensational head-lines, they would prevent consumers becoming needlessly alarmed to the great injury of the dealer in canned food. And if they would deal as fairly in reporting the facts as the daily from which we quote, the true facts would be well understood in every household, and an antidote provided for the sensational cases from time to time reported.

AMERICAN PUMPING-ENGINES IN ENGLAND.

MESSRS. JAMES SIMPSON & Co., the English manufacturers of the Worthington pumping-engine, have secured an order for an 18,000,000-gallon engine for the West Surrey Station of the London Water Department. Within a few months past several of this type of engine have been sold in England—a matter which is of no little interest to American mechanical engineering firms.

Association News.

NATIONAL ASSOCIATION OF WATER-WORKS CONTRACTORS.

THE semi-annual convention of the National Association of Water-Works Contractors was held at Saratoga, August 26 and 27, with the president, Mr. John T. Langford, of Boston, in the chair. Although it had been the intention to combine pleasure with business at this meeting, and considerable of the time was allotted to the gayeties of the place, much work was performed in furthering the objects for which the association was instituted.

A number of new members were elected, and papers were presented on the following subjects: The Building of Earth and Stone Reservoirs; Cast-Iron Pipe; Pipe-Laying; Stand-Pipe Construction; Gates and Hydrants; and an interesting treatise on Special Castings.

As these papers were intended to be but preliminary drafts received in executive session, they were referred to a Revision Committee, composed of engineers, manufacturers, and contractors, instructed to return them after consideration to the association for its approval at the next annual meeting, which will be held at Young's Hotel in Boston, during January next.

The remainder of the time was pleasantly filled at the races, and in an enjoyable trip to Mt. McGregor and those points of interest associated with the memory of Gen. Grant.

Although this association is yet in its infancy it numbers nearly one hundred members, among whom are prominent engineers, contractors, and manufacturers engaged in water-works construction. Its aims are to induce a greater harmony of feeling between hydraulic engineers, contractors, and their patrons, and to create a standard of better and more thorough work.

AMERICAN SOCIETY OF MECHANICAL ENGINEERS.—The seventh annual meeting will be held in New York City the week following Thanksgiving week. Persons desiring to be elected members must see to it that their application papers are sent to the secretary, Mr. F. R. Hutton, 280 Broadway, New York, before October 15. The society at the Chicago meeting passed a resolution that papers on *Shop Economics* should be solicited for reading in the general meetings instead of before an Economic Section of the society only. Members who have facts and methods of value in the matter of systems of shop-orders, methods of accounting, of superintendence, of management, and of economic production will be gladly heard from. It was found, also, that the topical queries and discussions would have been even more valuable had it been known in advance that certain of them were coming up. An effort will be made this fall to send these topics around in advance, if members will send to the secretary their queries and points several (at least four) weeks before the date fixed for the meeting. As all papers presented at the meeting must be put in type and copies distributed to members beforehand, it is desired that authors should send their manuscripts to the secretary before September 22.

PERSONAL.

CABLE dispatches on last Tuesday announced the death of Dr. Wakely, proprietor and editor of the London *Lancet*. He died of the disease from which he had been suffering for some time—cancer of the tongue.

Notes.

For works for which proposals are requested, see also the "Proposal Column," pages 317 and 318

CONSTRUCTION.

WATER-SUPPLY WANTED.—Belfast, Me., wants proposals, until September 4, for furnishing a system of water-works for fire purposes. Address D. W. Pitcher, Chairman of the Committee on Fire Department.

HERKIMER, N. Y., is considering the question of water-works. A special election was held August 31. We have not learned the result.

CLEVELAND, O., wants water-works, and the City Clerk, W. L. Lundy, will receive proposals until September 9. The contract price is not to exceed \$34,500. A. A. Richardson, of Lincoln, Neb., is the Consulting Engineer.

OWASSO, MICH.—The question of water-works for this place, a thriving town of about 6,000 inhabitants, was voted on last week. It is proposed to begin with about ten miles of pipe, and the plant is expected to cost \$40,000.

BATH, ME., wants to make a contract for building water-works.

ROCHESTER, MINN., will receive bids for constructing water-works. This was decided upon August 23, as the parties who recently submitted the lowest bid had not put in an appearance.

WAHJAMEGA, MICH.—The township of Indian Fields will be bonded for \$3,000, to build an iron bridge over the Cass River at this point.

TORONTO will need another pipe conduit, for water-supply, across the Bay, and the superintendent of the water-works has been instructed to prepare a resolution for submission to the Aldermen to make the necessary appropriation.

The trunk-sewer scheme has now reached the stage when a by-law providing for construction is to be submitted to popular vote. The cost is put at \$1,395,784. It has been approved by Mr. Charles Sproatt, City Engineer.

BRIDGEPORT, CONN., will receive bids until September 4, on supplying not more than 20,000 gross tons, nor less than 15,000 gross tons of trap-rock annually for five years. Address the Board of Public Works, Bernard Keating, clerk, 446 Main Street, Bridgeport, Conn.

POUGHKEEPSIE, N. Y.—At last the project for a bridge over the Hudson River, at this point, seems likely to be carried out. The contract was made last Saturday with the Union Bridge Company for the works. The bridge will consist of five spans, each 325 feet long, three truss and two cantilever, the lower chord of the trusses to be 135 feet above high water, and the cantilevers to have a clear headroom of 165 feet. The track will be upon the top chord, 200 feet above high water. There will also be a short span on the west shore, and about a quarter of a mile of viaduct on the east shore. The bridge will be supported upon steel towers, and the river spans will be of steel and the viaduct of iron.

MILWAUKEE, WIS.—The bids opened August 27 for the building of the new bridge at Pleasant Street were as follows: Substructure, C. H. Starke, \$21,250; W. T. Casgrain, \$22,475.

Superstructure, Chicago Bridge and Iron Co., \$10,200; F. Weinhaber, \$9,877 and \$12,977; Detroit Bridge & Iron-Works, \$12,600; W. H. Keepers, \$8,947. \$10,827, and \$11,200.

The City Attorney of Milwaukee, Wis., has been instructed by the Common Council to prepare a bill to be presented and, if possible, passed at the next State Legislature, authorizing the Common Council of the city of Milwaukee to issue \$175,000 worth of bonds, the money derived from the sale of such bonds to be used for the purpose of improving the sanitary condition of the Milwaukee River, by means of a flushing-tunnel connecting Lake Michigan with the Milwaukee River below the dam. Also, the sum of \$3,000 has been appropriated to pay for the necessary borings to be made along the line of the proposed Milwaukee River flushing-tunnel to determine the nature of the subsoil and stratum.

An ordinance was introduced into the Common Council giving Washington Becker the right to construct all needful trenches, endless cable, and other machinery to run a cable-road, with grip-cars, etc., on Grand Avenue and other streets traversed by the lines of the West Side Street-Railway Company, as the intention is to do away with horses and lay an endless cable.

TORONTO, ONT., COURT-HOUSE.—The sum of \$200,000 has been voted for the new court-house. The work will greatly exceed that figure. The excavations have cost \$9,000, the masonry of foundations is let at \$111,000, and estimates now presented place the total cost at over \$300,000 to finish the building in the plainest manner.

ROCKVILLE, CONN.—The Hockanum Manufacturing Company has given the contract for building their new mill to D. J. Curtis for \$75,000. The mill will be of brick, 296 feet long, 42 feet wide, and four stories high.

PITTSBURG, PA.—The Pennsylvania Construction Company have just received \$28,000 from the Columbia Iron and Steel Works for architectural iron-work.

EAST ORANGE, N. J.—Bids were opened by the Sewerage and Drainage Committee, August 27, on the construction of the new sewerage system, Carrol P. Bassett, engineer in charge. The work was divided into four sections, and the engineer's estimates were as follows: Section I., 8-inch pipe, 16,192 lineal feet; 9-inch, 3,941 feet; 10-inch, 3,334 feet; total, 23,467 lineal feet. Section II., 8-inch pipe, 33,451 lineal feet; 9-inch, 580 feet; 10-inch, 1,390 feet; 12-inch, 2,135 feet; 15-inch, 4,325 feet; 24-inch, 4,252 feet; 2x3 feet sewer, 1,751 feet; total, 47,884 lineal feet. Section III., 8-inch pipe, 21,926 lineal feet; 9-inch, 1,915 feet; 12-inch, 1,390 feet; 15-inch,

3,142 feet; 18-inch, 1,350 feet; total, 29,723 lineal feet. Section IV., 8-inch pipe, 18,978 lineal feet; 9-inch, 1,212 feet; 10-inch, 2,594 feet; 12-inch, 1,710 feet; 20-inch, 3,161 feet; total, 27,655 lineal feet; grand total, 128,733 lineal feet. Manholes in Section I., 75; in Section II., 120; in Section III., 90; in Section IV., 65. Flush-tanks, in Section I., 8; in Section II., 19; in Section III., 6; in Section IV., 11. The price per manhole is for two classes, both exclusive of iron—viz., (1) per vertical foot less than 12 feet, (2) per vertical foot more than 12 feet. The price is for flush-tanks complete, inclusive of covers and steps, but exclusive of internal fittings.

	Charles Hart, Brooklyn, N. Y.	B. M. & J. F. Shanley, Newark, N. J.	Thomas A. Nevins, Orange, N. J.	J. J. Coogan, Hoboken, N. J.	B. T. Coyle, Washington, D. C.	James A. Rooney, Paterson, N. J.	Keogh & Conway, Newark, N. J.
SECTION I.							
8-inch.....	\$0.86	\$1.40	....	\$0.98	\$0.65	\$0.95	....
9-inch.....	0.90	1.45	..	3.50	1.15	1.51	....
10-inch.....	2.22	1.50	....	3.50	.72	1.39	....
SECTION II.							
8-inch.....	\$0.86	\$1.40	....	....	\$0.65	\$0.95	....
9-inch.....	.90	1.45	....	....	.65	.99½	....
10-inch.....	.98	1.50	....	....	.72	1.23	....
12-inch.....	2.36	1.95	....	....	.90	1.39	....
15-inch.....	1.31	2.45	....	....	.95	1.54	....
24-inch.....	3.16	4.20	....	....	2.75	3.20	....
2x3 feet.....	3.00	5.22	....	....	4.50	4.80	....
SECTION III.							
8-inch.....	\$0.86	\$1.40	....	....	\$0.65	\$0.95	....
9-inch.....	.90	1.45	....	....	.65	.99½	....
12-inch.....	1.10	1.95	....	....	1.60	2.19	....
15-inch.....	3.30	2.45	....	....	2.50	2.00	....
18-inch.....	1.61	2.94	....	....	1.40	1.82	....
SECTION IV.							
8-inch.....	\$0.86	\$1.40	\$0.90	....	\$0.70	\$0.95	\$2.50
9-inch.....	.90	1.45	1.00	....	.95	1.15	3.00
10-inch.....	.98	1.50	.80	....	.95	1.08	4.50
12-inch.....	1.10	1.95	2.15	....	1.50	2.20	3.00
20-inch.....	1.72	3.46	4.25	....	2.00	2.92	5.50
MANHOLES.							
All sections vertical feet < 12 feet.....	\$3.00	\$4.00	\$3.75	\$15.00	\$2.25	\$3.00	\$3.00
All sections vertical feet > 12 feet.....	3.00	5.00	7.00	20.00	2.50	4.50	7.50

TOTALS.

BIDDERS.	Section I.	Section II.	Section III.	Section IV.	Grand Total.
Charles Hart.....	\$28,041.50	\$65,574.73	\$38,520.96	\$30,604.92	\$162,751.11
B. M. & J. F. Shanley.....	37,890.25	98,877.81	53,380.25	51,187.16	241,335.75
Thomas A. Nevins.....	....	....	....	43,262.90	....
J. J. Coogan.....	55,175.66	....	....	....	....
B. T. Coyle.....	20,651.43	54,242.70	31,119.40	20,043.05	125,257.58
James A. Rooney.....	30,199.85	72,224.67	39,700.74	39,690.03	181,815.28
Keogh & Conway.....	....	....	....	91,022.54	....

Extras at prices fixed or given by the Engineer. Coyle being the lowest bidder on each and all, the Committee recommended he be awarded the contract. The plans for the disposal works are about done, and work will soon be commenced on them.

COLUMBUS, O.—A contract for \$7,800 has been awarded the Pennsylvania Construction Co., at Pittsburg, by the Columbus Steel Co., for iron-work.

CHARLESTOWN, W. VA.—Smith & Connors, steam-heating engineers of Cleveland, O., will soon begin the steam-heating amounting to \$3,000 in the residence of Mr. A. M. Harmon, formerly owned by Boothrod Washington, Esq.

LITTLE ROCK, ARK.—Sewer district No. 9 has been incorporated to put in the Waring system of sewers. Mr. J. H. Hanly, of Little Rock, Ark., can give all information.

IT is estimated that nearly 6,000 tons of iron will be used in the city bridges begun or completed this year in Cleveland, O.—viz.: Kingsbury Run Viaduct, 940 tons; Walworth Run Bridge, 350 tons; Central Viaduct or Belt Line Bridge, 4,500 tons.

THE Board of Army Engineers for Fortifications held a meeting in this city last week, on the Arthur Kill Bridge. They will soon report to the Secretary of War.

FRANKFORT, IND.—The gas-works at this place have been purchased by A. D. Cressler, President of the Kerr Murray Manufacturing Company, of Fort Wayne, Ind., and a syndicate of Philadelphia and Fort Wayne and Peru, Ind., capitalists.

GOVERNMENT WORK.

COLUMBUS, O.—Synopsis of bids for furring and lathing Court House, etc., opened August 26, 1886: Haugh, Ketcham & Co., \$1,716, additional work per square foot 12 cents; John Cooper, \$1,800.

QUINCY, ILL.—Synopsis of bids for furring and lathing Post-Office, etc., opened August 26, 1886: Haugh, Ketcham & Co., \$576.20, additional work per square foot 12 cents.

QUINCY, ILL.—Synopsis of bids for joiner's work, wood flooring, Post-Office screen, glass, hardware, and painting, opened August 24, 1886:

BIDDERS.	Amount.	Per square foot for additional flooring.
Cudell & Lehmann.....	\$26,950	12½c.
Robert Mitchell Furniture Co....	18,388	17
John Mitchell.....	15,470	7
John Moore & Co.....	18,250	15
Larkworthy & Menke.....	19,416	7½
Joseph Knittel.....	26,018	20

JEFFERSON CITY, MO.—Synopsis of bids for plastering Court House, Post-Office, etc., opened August 24, 1886: Joseph Eastman, \$2,600.

CONCORD, N. H.—Synopsis of bids for columns, beams, and girders for Post-Office, etc., opened August 24, 1886: Heuvelman & Co., \$3,624; James McKinney & Son, \$3,240; Thomas Marshall, \$3,325; George F. Smith Iron Co., \$3,347; L. M. Morris, \$2,760; East River Iron Works, \$3,960; Builders' Iron Foundry, \$3,275.

THE following bids were opened by Colonel Casey for furnishing blue-stone flagging for the approaches to the west wing of the State, War, and Navy Department Building August 26: R. Rothwell, 63 cents per square foot; Rees Evans, 73 cents; Acker & Co., 74 cents; and Burns & Son, 74 cents, all of Washington. Bids were also opened for cut granite for the approaches of the west wing as follows: M. A. McGowan, of Washington, \$18,738.42; Washington Granite Monumental Company, of Nashville, Tenn., three bids, \$14,373.51, \$14,995, \$15,740.84; Granite Railway Company, of Boston, \$11,333; Davis Tilson, Rockland, Me., \$11,050; Bodwell Granite Company, of Maine, \$11,766.26; Gill & McMahon, Baltimore, \$9,763.

RALEIGH, N. C.—The Special Committee of the Board of Aldermen on August 22 reported in favor of awarding a contract for constructing and maintaining water-works to Nelson G. Green, for gang-wells system, at \$3,200 per annum. A summary of bids is given below:

BIDDERS.	No. of Hydrants.	Price per Hydrant.	Annual Cost.
Stewart, Shireffs & Co., Richmond, Va.....	80	\$110.00	\$8,800
American Water-Works and Guarantee Co., McKeesport, Pa.....	125	68.00	8,500
American Water-Works and Guarantee Co.....	80	100.00	8,000
Stewart, Shireffs & Co.....	80	100.00	8,000
J. C. Brewster, Raleigh, N. C.....	125	64.00	8,000
J. C. Brewster.....	80	99.00	7,920
Anderson & Foster, Talladega, Ala.....	80	93.75	7,000
Stewart, Shireffs & Co.....	80	90.00	7,200
Peter Herdic, Williamsport, Pa.....	160	37.50	6,000
Water and Gas Construction Co., Pittsburg.....	120	50.00	6,000
A. H. Howland, Boston, Mass.....	80	75.00	6,000
Turner, Dillaway & Rawson, Boston, Mass.....	80	73.00	5,840
Jesse W. Starr, Philadelphia, Pa.....	80	70.00	5,600
Moffit, Hodgkins & Clark, Watertown, N. Y.....	150	34.66	5,200
Moffit, Hodgkins & Clark.....	120	43.33	5,200
National Water-Works Co., Dayton, O.....	100	49.00	4,900
Goodhue & Birnie, Springfield, Mass.....	100	48.00	4,800
S. R. Bullock & Co., New York.....	80	60.00	4,800
S. R. Bullock & Co.....	80	60.00	4,800
National Water-Works Co.....	80	56.00	4,400
Moffit, Hodgkins & Clark.....	100	42.00	4,200
W. W. Taylor, Philadelphia.....	80	50.00	4,000
Peter Herdic.....	80	50.00	4,000
S. R. Bullock & Co.....	80	50.00	4,000
J. C. Brewster.....	80	49.50	3,960
Gang-Wells Systems (N.G.Green), New York.....	80	40.00	3,200

R. D. Wood & Co., of Philadelphia, offered to build works, for sale to the city after two years, for \$125,000. Final action has not yet been taken by the Aldermen.

THE Veteran Engineers of the United States Army held a reunion at Fort Independence, Boston, last week. The old board of officers was re-elected as below: President, Melville C. Grant; Vice-Presidents, J. W. Parker, W. F. Sutherland; Secretary and Treasurer, Frank Beahn. The veterans are composed of Companies B, C, and D, and the members reside in different parts of the United States. Company C of the engineer corps was recruited in the fort by General McPherson in the early part of 1861.

Patents.

No. 347,403, granted to Charles H. Weideman, of Chicago, Ill., assignor of one-half to Richard Smith of the same place, is for filters suitable for attaching to the supply-pipe of basins, etc. A branch connection with the supply-pipe and the connection of the filter with the waste-pipe by suitable cocks allows of cleansing the filter by directing the water through it in the reverse direction.

No. 374,430 is granted to William F. Lambert, of San Francisco, Cal. The tub contains an upright cylinder, having a piston, the piston-rod of which is connected with a platform. The cylinder with a shower so that the weight of the person standing on the platform produces a shower-bath.

No. 347,438, for a rock-drill, is granted to Theodore W. Sterling, of New York.

No. 347,461, for pipe-coupling, is granted to Georges O. L. Leprevost-Bourgerel, of Paris, France.

No. 347,469, for a gas-engine, is granted to John H. Clark, of Boston, assignor to Oliver Ames, of Easton, Mass.

No. 347,474 is granted to Carl F. W. Doehring, of Leipsic, Saxony. It is the combination of floor-beams and of channeled porous fire-proof stones above and below said floor-beams, with an insulating material and with metal plates attached to said stones, and with a plaster coating. The combination of a fire-proof layer with molded bricks that cover the beams and with a metal layer, the fire-proof layer being composed of ashes and of lime, gypsum, or cement treated with sulphuric acid, all being so constructed that a space is left beneath the flooring, substantially as specified. The combination of a fire and water-proof floor with veneers which are made fire-proof and water-proof, and which are glued directly upon the surface of the floor, substantially as specified.

No. 347,489 is for a hanger for piping, granted to Percy N. Kenway, of New York. It is the combination of a pair of grip-clamps to take a beam, a bolt for holding them together and in a fixed position on the beam, a swing-pocket or stirrup, through the upper portion of which the bolt passes, and upon which it slides longitudinally, a hook or bolt passing through and adjustable upon the lower portion of the swing-pocket, and a suspension ring or hanger through which the piping passes.

No. 347,496, for catch-basin inlet and cover for sewers, is granted to Hiram W. McDonald, of Bucyrus, O. The top plate has vertical wings connecting it with the main body of the inlet, and the grating at the mouth is filled in guide-ribs so as to be detachable.

No. 347,561, for a gas-stove, is granted to Clarence L. Bisbee, of Brooklyn.

BUILDING INTELLIGENCE.

(Continued from page 318.)

NEW YORK CITY.—(Continued.)

Buckout st, n s, abt 100 w Ash st, 2½-story fr dwell; cost, \$5,000; o, Henry Budelman, Jr., 207 E 110th st; a, J. C. Kerby.

161st st, s w cor Cauldwell av, 6 2-story fr dwells; cost, each, \$3,000; o, Guilelma Farrer, Eagle av and 161st st; a, W. W. Gardiner; b, not selected.

Forest av, w s, 145 s 165th st, 6 3-story fr dwells; cost, each, \$3,200; o, John W. Decker, 841 Forest av; a, Adolph Pfeiffer.

162d st, s s, abt 212 w Fleetwood av, 3-story fr and br dwell; cost, \$7,500; o, Francis Keil, 163 E 53d st; a, J. A. Stark.

Sedgwick av, w s, nearly opposite 201st st, Morris Dock, 2-story s and fr dwell; cost, \$5,600; o, Wm. C. Doscher, 63 1st st; a, H. G. Knapp & Co.; m, James Parker; b, not selected.

637-639 Walton av, 2 3-story and bmt br dwells; cost, each, \$6,000; o, Anna T. Dale; m, J. B. Martin.

BROOKLYN.

Decatur st, n s, 20 w Throop av, 3 2½-story and bmt b s dwells; cost, each, \$4,500; o, H. B. Moore, 326 Tompkins av; a, A. Hill.

10th st, n s, 300 e 5th av, 6 2-story and bmt br dwells; cost, each, \$4,000; o, Mrs. M. O'Brine, 314 10th st; a, T. Corrigan.

Park av, s s, 80 w Marcy av, 5 3-story fr (br filled) tens; cost, each, \$4,500; o and b, George Straub, 22 Ditmars st; a, Platte & Acker.

BUILDING INTELLIGENCE.

Bushwick av, e s, 25 s Covert st, 2 2-story fr (br filled) dwells; cost, \$3,850; o, A. M. Sagar, 1248 Bushwick av.

Covert st, n s, 75 w Bushwick av, 2 2-story fr (br filled) dwells; cost, \$3,850; o, A. M. Sagar.

Bergen st, s s, 350 e 3d av, 2 4-story br tens; cost, each, \$10,000; o, James Dearing, Henry st; a, Parfitt Bros.; b, not selected.

7th av, s e cor 10th st, 5 3-story b s stores and dwells; cost, each, \$6,000; o, Chas. Nick-ning, 11th st.

Halsey st, s s, 150 w Nostrand av, 2 3-story and bmt br dwell; cost, each, \$7,000; o, D. H. Fowler, 777 Bedford av; a, G. P. Chappell; b, not selected.

1008-1010-1012 Gates av, 3 3-story br stores and dwells; cost, each, \$7,500; o, William H. Murtha, Hall of Records; a, W. Field & Son; b, J. Young and J. C. Saukins.

Bedford av, e s 150 e Flushing av, 2 4-story fr (br filled) stores and tens; cost, each, \$5,000; o, John F. Ryan, 187 Hewes st; a, A. Hill.

5th av, n e cor St. John's pl, 5 4-story granite apart houses; total cost, \$50,000; o, McLoughlin and McConnell; a, W. M. Coots; m, J. Donohue; c, day's work.

23 Cranberry st, n s, 25 e Willow st, 3-story br stable and dwell; cost, \$7,000; o, Charles Arbuckle, 82 Willow st; a, A. F. Norris; b, J. Guilfoyle and J. B. Twaits.

338 9th st, s s, near 5th av, 3-story and bmt br dwell; cost, \$6,800; o, Amelia A. Bishop, 336 9th st; a, H. F. Jelliff; b, J. Guilfoyle and W. S. Wright.

Greene av, n e cor Stuyvesant av, 4-story br store and ten; cost, \$10,500; o, James F. Fick, Atlantic av, near Miller av; a, M. J. Morrill; b, P. Carlin & Son and G. Conine.

Degraw st, s s, 75 e 4th av, 5 2-story and bmt b s dwells; cost, each, \$2,500; o, George R. Brown, 34 South Portland av; b, L. E. Brown and J. F. Reutana.

Marcy av, e s, 100 s Penn st, 2 3-story and bmt br dwells; cost, each, \$4,000; o, a, and b, John H. Hoffman, 257 Hewes st.

11th st, n s, 116 w 3d av, 2 3-story fr tens; cost, each, \$3,500; o, M. A. McCormick, 104 15th st; a and c, T. McCormick; m, J. Anderson.

Halsey st, s s, 300 e Nostrand av, 6 3-story and bmt br dwells; cost, each, \$5,000; o, Wm. B. Moore and Wm. O. Thompson, 326 Tompkins av, and 135 Lefferts pl; a, A. Hill.

Putnam av, n s, 85 e Sumner av, 5 2½-story and bmt br dwells; cost, each, \$6,500; o, A. Stewart Walsh, 643 Madison st; a, A. Hill; b, T. Miller.

27th st, n s, 225 e 4th av, 5 3-story br flats; cost, each, \$4,000; o, Matilda Goodwin, 123 28th st; a and b, J. P. M. Goodwin.

25 Chapel st, 4-story br apart house; cost, \$7,000; o, Miss E. T. Glassie, 269 Sackett st; a, G. M. Walgrove.

President st, s s, 162 w 8th av, 2 3-story br dwells; cost, each, \$12,000; o, Sarah H. Burckett, 812 President st; a, C. F. Burckett; b, H. B. Moore.

149 Washington st, e s, 75.0 n High st, 5-story br store and ten; cost, \$25,000; o, M. Burtis, Englewood, N. J.; a, H. P. Fowler; b, not selected.

26 Sycamore st, 4-story br ten; cost, \$9,000; o, Edward Buckley, 217 Cherry st, New York; a, C. F. Eisenach; b, not selected.

18th st, n s, 200 e 10th av, 5 2-story fr dwells; cost, \$9,000; o, E. Dessner and J. D. Murphy, 251 Smith st and 569 18th st; a, W. H. Wirth; b, not selected.

Broadway, s e cor Van Buren st, 3-story fr (br filled) store and dwell; cost, \$5,500; o and b, Henry Sahlfeld, Marcy av, cor Division av; a, H. Vollweiler.

(Continued on page 332.)

ANNOUNCEMENT.

The publication of the sixth revised edition of the U. S. Pharmacopoeia (1880), containing as it does much more strict requirements for the purity and strength of pharmaceutical preparations, has been followed in some States of the Union by the enactment of laws against the adulteration of drugs, which laws make the Pharmacopoeia the official standard.

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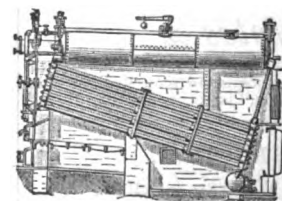
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EARTHQUAKES AND BUILDING.

THE recent severe earthquake shocks which have wrought such havoc in the city of Charleston and vicinity are probably unique in being the first in this country to cause destruction of life. The wide-spread destruction of property also accompanying them cannot but bring to the mind of every thoughtful engineer and architect the question whether this hitherto apparently remote danger to permanent structures is not of sufficient probability to require its recognition in all designs. There have been well-defined earthquake shocks in the vicinity of New York and many other parts of the country, and it would seem desirable that the practical bearings of the subject should be carefully studied. A recent paper by Professor John Milne, F. G. S., of the Imperial College of Engineering at Tokio, Japan, in Vol. 83 of the Proceedings of the Institution of Civil Engineers, and the discussion following, gives some valuable information in this direction. He shows that the motions arising are performed in ellipses, paths like the figure 8, spirals, and in a complexity of directions too intricate to define. They vary in direction, intensity, and amplitude. The direction may be vertical, horizontal, or of these combined, and in regard to any particular building this may have much to do with its liability to damage from a shock. The intensity or speed of acceleration, by which the highest velocity of motion is reached, varies greatly in different shocks and in different localities during the same shock, and the author says "it is evident that there may be a disturbance of very large amplitude which would produce no destruction whatever." By this he clearly means to say that if the acceleration of velocity be small, there will be time for the inertia of buildings to be overcome, and the wave transmitted through them without damage. The experiments at Tokio went to prove that there was *least* horizontal motion on the hills (although this rule seems to be reversed at Yokohama) or on relatively hard or high ground, and more motion on soft ground. At Ischia, buildings on hard solid lava were uninjured, while those on loose waters, tufa, or clay suffered most. In a pit ten feet deep, at Tokio, the motion was almost inappreciable. Of five different earthquakes recorded in the pit the motion as compared with that at a point twenty feet distant on hard ground was as 1 to 43, the maximum velocity as 1 to 52, and the maximum acceleration as 1 to 82.

Prof. Milne suggests the support of buildings in earthquake countries upon horizontal cast-iron plates, between which are cast-iron shot one-quarter of an inch in diameter (the cracking strength of each of which is about 1,800 pounds). He also suggests deep foundations free from the surrounding earth; that all arches where such are necessary shall be curved into, and not form an angle at the abutments—in other words, the substitution of elliptical or other curved forms for segmental arches; that windows and doors

shall not be vertically over each other, since they form lines of weakness, as has been repeatedly illustrated in destructive shocks; that high buildings should be avoided; that upper parts of walls, and also roofs, should be made as light as possible, and that steeply pitched roofs are dangerous.

It is particularly recommended that any two parts of a structure having different vibrational periods be not coupled together. A case is mentioned of a factory chimney which was connected by an iron band to a neighboring building, being cut in two by the band during a shock. The chimneys of almost every bungalow have been shorn off in repeated cases. Where necessary that various parts be united, it should be so thoroughly done that all move together, otherwise it is better that they be entirely separate.

The Italian Government Commission, after the earthquake at Ischia, recommended that buildings be not over two stories, or thirty-one feet in height of walls; that they be square, and placed with one diagonal in the direction of the last shock, and that they be constructed chiefly of an iron or wood frame-work thoroughly united by diagonal ties both horizontally and vertically.

All the writers agree that substantial, well-built buildings are much less liable to destruction than others. The walls of the moats and castle gates in Japan, for example, have poorly cut stones pyramidal in shape, with spaces filled with loose rubble, and a slight movement brings them down, while few well-built buildings in Japan have been destroyed. In the Charleston shocks it will be remembered that comparatively few persons who stayed indoors were injured, the destruction of life having been mostly from falling cornices and chimneys. In the terrible catastrophe which took place at Iquique, a well-framed timber house withstood the shock and the tidal wave which followed, and was floated out into the bay with its contents intact.

In conclusion, we give from an article on the Granada earthquake of 1884, by Edward J. T. Manby, M. I. C. E. (in Proceedings of the Institute of Civil Engineers, Vol. 85), the recommendations of the Spanish authorities after that event:

"First—All streets should cross each other at right angles, and lie diagonally to the direction of the geological faults.

"Second—The widths of streets should never be less than double the maximum height allowed by law for the buildings on them.

"Third—No house should have more than one story.

"Fourth—All materials and building should be of unexceptionable quality."

In view of the fact that certain localities—as, for example, low ground at the foot of a precipice, "that is to say, precisely over a geological fault"—are much more exposed than others to destructive earthquakes, it is recommended that seismological observatories be established for determining the best locations on which to build.

It would seem, from what has been said, that what is needed is not so much special methods of construction or new designs, but rather a proper restriction of the heights of buildings, such as is called for by considerations of hygiene, as well as for safety from earthquakes, and closer attention to solidity of work, by care in bonding and tying together and a thorough filling of joints in all masonry.

We are glad to be able to compliment the Philadelphia Association of Master Plumbers on its energy in trying to prevent an infringement of the plumbing ordinance, even if the local Board of Health is lax and willing to permit it. The details are found in our correspondence from Philadelphia, and we have already in a previous issue referred to the case. It seems that a wealthy builder represented to the board that it was impossible for him to observe the rule forbidding the laying of a house-drain in a yard

be most wholesome, since it will be a notification that favoritism or discrimination will not be tolerated.

OUR BRITISH CORRESPONDENCE.

Refuse Dumped in Brick-field Pits—Paper Gas and Water Service-Pipes—Traction-Engine at the Liverpool Exhibition—Lighting the Mersey Tunnel—An Ash-Pit Used as a Privy-Vault.

LONDON, August 21, 1886.

DR. GWYNN, the Medical Officer of Health for Hampstead, has just called attention, in his July report, to a system adopted by the owners of brick-fields, which is unquestionably prejudicial to the future health of the neighborhood which will grow up after the brick-fields are abandoned as such. The proprietors have, of course, in carrying out their business, to extract clay from the site, and, in order to fill up the holes so made, they adopt the

son's "Rocket," stands a working-model of a 6-horse power Aveling & Porter traction-engine, made by Mr. Stephen H. Terry, of Fairlawn, Surbiton, Surrey, of the Local Government Board, London. The engine is about twenty inches long by ten inches broad across the driving-wheels. It weighs seventy pounds, and can pull a load of three-hundredweight on the level with fifty pounds of steam-pressure. The cylinder is one inch in diameter and $1\frac{1}{4}$ -inch stroke; the crank-shaft is geared about nine revolutions to one of the road-wheels. The engine has every appliance usually fitted to traction-engines, including compensating gear for turning corners, a winding drum with steel-wire rope for pulling loads over soft ground, and spring-wheels to reduce the injury to roads and increase the traction power. The model is lagged with Bell's asbestos millboard, covered with walnut-wood veneer, polished, held in place by brass bands; the effect is very pleasing, and such is the efficiency of the asbestos as a non-conductor of heat, that although the boiler temperature is that due to fifty pounds of steam, or 295° Fah., the varnish and wood casing remain cool. The



A COUNTRY HOUSE AT CEDARHURST, L. I.—BRUCE PRICE, ARCHITECT.

parallel to a street or alley, because there was not descent enough in the street to give proper fall to the drain. On this showing the Board of Health consented to his request to be permitted to lay the drain in the yards in violation of the rule. The Master Plumbers' Association heard of the case, investigated it, and proved to their satisfaction that all the fall needed could be had if the drain were laid in the street. They exposed the misrepresentation to the board, and requested that the violation of the rule be not allowed. Now the association has gone further, employed counsel, and obtained an injunction restraining the board from granting the permission. This is backbone of the most commendable sort, calculated to do more than all essays and high-sounding phrases to convince the community that a plumbers' association can do genuine work for its welfare. Never before, we suppose, has a plumbers' association taken such a step, which is a revival of the best traditions of the old guild, in its jealousy for the good name of the craft, and the effect of this action will

system of dumping general refuse into the holes and giving it a top dressing of earth. In my letter respecting the Dublin Health Exhibition, three years ago, I commented on the same state of affairs, which was exposed by the Surveyor of Dublin, the culprits in this case being the municipal authorities. It was bad enough for Ireland to do such a thing, but I did not think that the same system had been carried out here in England, where sanitary matters do certainly receive a greater meed of attention.

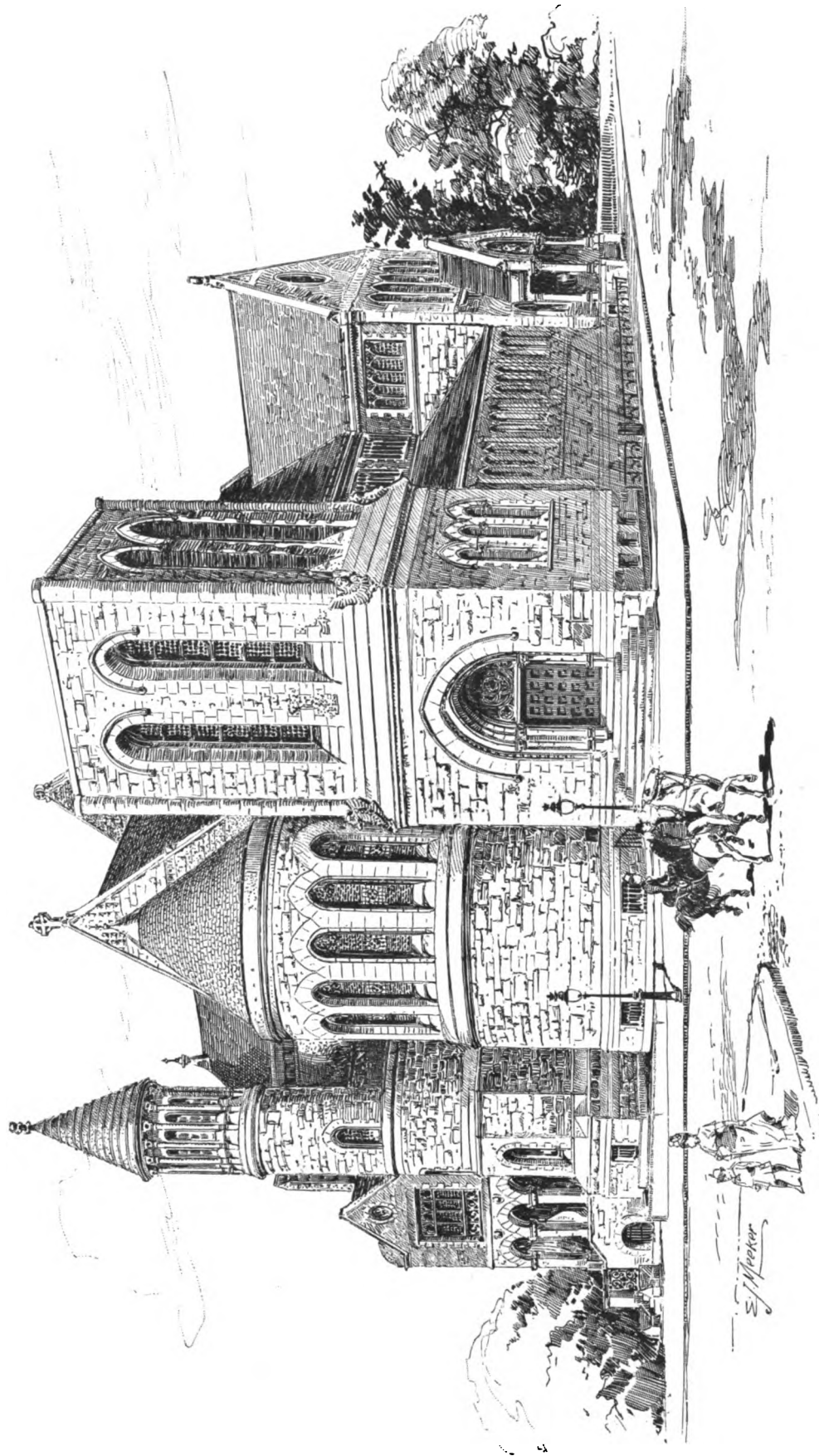
Paper gas and water service-pipes, stated to resist an internal pressure of 2,000 pounds, have lately been exhibited in Vienna. The process of manufacture is as follows: Slips of paper, the width of which is equal to length of the pipe section desired, are drawn through melted asphalt, and then wound upon a mandrel of the requisite diameter of the pipe. After cooling, it is pulled off the mandrel, the inside being treated with a kind of enamel, the outside painted with asphalt varnish and dusted over with sand. The thickness of the pipe exhibited is only about half an inch.

In the central hall of the Liverpool Exhibition, and adjacent to Mr. Webb's wooden model of George Stephen-

son's "Rocket," stands a working-model of a 6-horse power Aveling & Porter traction-engine, made by Mr. Stephen H. Terry, of Fairlawn, Surbiton, Surrey, of the Local Government Board, London. The engine is about twenty inches long by ten inches broad across the driving-wheels. It weighs seventy pounds, and can pull a load of three-hundredweight on the level with fifty pounds of steam-pressure. The cylinder is one inch in diameter and $1\frac{1}{4}$ -inch stroke; the crank-shaft is geared about nine revolutions to one of the road-wheels. The engine has every appliance usually fitted to traction-engines, including compensating gear for turning corners, a winding drum with steel-wire rope for pulling loads over soft ground, and spring-wheels to reduce the injury to roads and increase the traction power. The model is lagged with Bell's asbestos millboard, covered with walnut-wood veneer, polished, held in place by brass bands; the effect is very pleasing, and such is the efficiency of the asbestos as a non-conductor of heat, that although the boiler temperature is that due to fifty pounds of steam, or 295° Fah., the varnish and wood casing remain cool. The

One would have thought that the electric-light, or perhaps the more modest gas, or even oil, would have been used for the purposes of lighting the Mersey Tunnel extension works at Liverpool, but the contractors are advertising for tenders for the supply of 32,000 pounds of candles.

Here is another instance of the appreciation of the first laws of sanitation. At Gateshead, a man has been summoned to show cause why he should not abate a nuisance on his land. The Sanitary Inspector, Mr. Jours, had served already two notices requiring abatement, without effect. The nuisance consisted of an ash-pit, twelve feet nine inches long by six feet wide. This ash-pit was used by sixty-nine persons, and was only three feet six inches east from the dwelling-house. In clearing it out the contents had to be carried some forty yards. The



THE SANITARY ENGINEER ILLUSTRATED SERIES.

• ST. JAMES' EPISCOPAL CHURCH, NEW YORK CITY.

R. H. ROBERTSON, ARCHITECT.

Sanitary Inspector very properly demanded that water-closets should be substituted, and the desired order was made.

SAFETY-VALVE.

TESTS OF MATERIAL FOR THE ELECTRIC SUBWAY IN NEW YORK.

ON August 19 a series of public mechanical tests of various materials proposed for the electric subway were made by Dr. A. R. Ledoux, the chemist of the Subway Commission. As these tests would be useless to engineers without a knowledge of the mixtures used in preparing the samples, we have obtained at considerable trouble a nearly complete record of the mixtures, and now present it, together with the results obtained, in the tables given on the next page.

In obtaining the unit strain in the transverse tests the ordinary formula has been used. In matters of this kind a correct nomenclature is of the greatest importance, and we regret that an error has been made at the outset by those having this enterprise in charge. Their specifications call for "asphaltic concrete," whereas coal-tar and its products are not asphalts, and to call any mixture consisting largely of them "asphaltic" is misleading, while the word "concrete" belongs properly to mixtures of lime or hydraulic cements. The word "mastic" is the proper one to use where hydro-carbons are the cementing material. The true asphalts are of mineral origin, and it is the opinion of all who have thoroughly studied the subject that they are more durable in character than any artificial pitch. Dr. Ure says: "Numerous experiments and observations have led me to conclude that fossil bitumen possesses far more valuable properties for making a durable mastic than the solid pitch obtained by boiling wood or coal-tar. The latter when inspissated to a proper degree of hardness becomes brittle and may be readily crushed into powder, while the former, in like circumstances, retains sufficient tenacity to resist abrasion. Factitious tar and pitch being generated by the force of fire seem to have a propensity to decompose by the joint agency of water and air, whereas mineral pitch has been known to remain for ages without alteration."

The rock asphalt mastics are prepared from a natural rock, consisting of carbonate of lime completely interpenetrated by varying amounts of bitumen. For example: The Val de Travers asphalt rock contains about ninety parts of carbonate of lime to ten parts bitumen, the Seyssel rock 90 to 91 per cent. carbonate of lime and eight to nine per cent. bitumen, etc. The mixture having taken place under immense pressure seems to be more intimate than can be produced artificially, so that the material will even resist the action of muriatic acid. The rock is finely ground, and to prepare the mastic blocks as they are imported to this country, about six per cent. of a compound of Trinidad bitumen and an oil called "goudron de schiste" is added. The goudron is the heavier oil distilled from a bituminous schist after the light oils are driven off. The blocks thus prepared are melted with an additional amount of bitumen and mixed with other substances according to experience and requirements of use.

Mr. W. O. Callender has, in a letter addressed to the chemist of the Subway Commission, brought together some of the opinions of experts respecting the use of such materials. He quotes Mr. Leon Malo, a well-known French authority, as writing: "Gas-tar or refuse of bottoms of mineral-oil factories can be used. Thus, a black-looking material is formed which to unaccustomed eyes appears to have the look of asphalt. These so-called asphalt mastics are in great favor with certain contractors whose guarantee is for one year, and who do not require for asphalt works a longer duration than their own guarantee. I need not say that their use is banished from all public works" (in France and England).

The Paris authorities have in all their specifications for asphalt work the following clause:

"Coal-tar pitch and all other analogous products are strictly prohibited." Similarly the commissioners for the District of Columbia have prescribed that for pavements "no product of the distillation of coal-tar is admitted." This prohibition is supported by the conclusions of a paper by Mr. E. P. North, read before the American Society of Civil Engineers.

As to their use underground, the experience of the London Metropolitan road is instanced. On a certain portion of their line a mastic of coal-tar was used over the arches, and on another part a preparation of natural asphalt, "with the result that while in the former case there is no part but is saturated with water, in the latter it is perfectly dry." Other instances of its failure when used to keep out dampness in foundations are noted, while natural asphalt in like circumstances was unchanged.

The experience in Washington with coal-tar mastics, used as pavements, was, that they last well for some years, but when they commence to break up the action is very rapid.

J. W. Chisholm, President of the Thomson-Houston Illuminating Co., of Chicago, writes: "This material is of a nature permeable by gases and afterward by water. Hydro-carbon gases from the leakage of the gas-pipes permeate it and make it porous. It is an insulating material (electrically), but after a comparatively short time it is not. It is at all times saturated by moisture, and is as good a conductor as earth."

Many dealers claim that coal-tar mastics can be made equal to the natural, but it is certain that such products have usually been irregular and disappointing in character,



A WINDMILL AT CEDARHURST, L. I.

and have led engineers to be afraid of their use in important works.

The specifications call for a material which shall bear a crushing strain of 4,000 pounds per square inch, a tensile strain of 300 pounds per square inch, that will not crack at 10° Fah. or soften below 160°, and that will not lose shape under 200° Fah. It must also be impervious, and resist the action of illuminating-gas, salt water, and organic acids. The sand used to be silicious, clean and sharp, and heated before mixing with the asphalt to the temperature of the latter. The natural bitumen, if used, to be freed from water, and contain in the semi-refined mastic not less than 60 per cent. of pure bitumen. No petroleum refuse or still bottoms to be used for softening it, but preferably paraffine or paraffine oil.

The conduits are to be rectangular in section, containing 2½-inch ducts, varying in number. The conduit is to rest on a foundation of Portland cement concrete six inches thick. The method of joining the sections to secure tightness is by the use of paper tubes covered with coal-tar pitch. Manholes are to be built at street-crossings. The specifications would seem to be deficient in requiring no test as to expansion and contraction from changes of temperature. Where these pipes come in the vicinity of the steam-pipes the temperature will be abnormally high, while at other points it will probably at times be as low

as the freezing point. A crack occurring at any point and admitting water would be fatal to the use of the conduit. It seems also to have been assumed that the *strongest* material would probably be the best. This by no means follows. That which with sufficient strength is also most durable should be selected, and as one-half the compressive strength required, or 2,000 pounds per square inch, is fully equal to that of much of the brick-work in our buildings, it is quite possible that a less compressive strength would give the more desirable material.

SEWERAGE IN IOWA.

THE thriving city of Cedar Rapids, in Iowa, is very nearly educated up to the point of providing for its convenience and comfort and averting disease, but has not quite reached the proper stage as yet. A proposition to construct sewers was submitted a few weeks ago to the popular vote, with the result that out of 1,807 votes cast there were 1,002 against the plan, thus defeating, for the present at least, the execution of what cannot be looked upon as anything but a necessary precaution against the spread of disease in a populous district.

The town was settled in 1839, and incorporated a city in 1856, and has had water-works since 1875. It contains now some 18,000 inhabitants. Through the centre of the city flows the Cedar River the bed of which is rocky and the current rapid.

On each side of the river the ground is level back for a distance of several blocks. It is elevated considerably above high-water mark in the river. On the side of the river where the largest portion of the population is the soil is quite sandy. In the lower level parts this is underlaid by stone, at a distance of some six feet from the surface. In the higher parts of the city the ground, while in the main sandy, has spots that are underlaid by thin layers of clay, forming basins that hold the water and make the ground wet. These frequently will drain if wells are sunk into a lower strata of sand and gravel.

The ground in older parts of the city is filled with privy-vaults and cesspools, and where there is stone underneath, the wells, vaults, etc., usually go to the stone and stop.

The conditions are favorable, therefore, for soil-pollution and resultant disease, and are equally favorable for the construction of a thorough system of drainage and sewerage.

Plans for such a system were prepared by Chester B. Davis, C. E., by direction of the City Council, and a scheme for their execution and for defraying the expense by an equitable assessment on property benefited, and the raising of a portion of the funds by general tax, was devised by the Sewerage Committee of the Council. But owing partly to ignorance, partly to apathy, and partly to the opposition of a class who are affected by the prohibitory laws regarding sale of liquor, and try to get even with the respectable class by insisting on "no license no sewer," the project is defeated for this year. For the sake of the decent citizens, it is to be hoped that no ill result will follow, but the continuance of filthy habits when means of relief are offered carries with it great risk and great responsibility.

OUR ILLUSTRATION OF A MODERATE-COST HOUSE.

A COUNTRY RESIDENCE AND WINDMILL AT CEDARHURST, L. I.—BRUCE PRICE, ARCHITECT.

THE house is situated on a fine hill overlooking the clubhouse and race-track at Cedarhurst, L. I., and commanding a beautiful view of the surrounding country and Long Beach meadows. It is a study of Long Island old colonial models, built of frame and shingled, and finished inside in the quaint style of those old homes. The cost was \$10,000. The owner is Mr. John D. Cheever, of New York, the architect Mr. Bruce Price, also of New York.

The windmill shown on this page is a balconied structure built of heavy frame and shingled. It has two tanks, one at the balcony level and the other a few feet under it, each holding from 2,000 to 2,500 gallons. The machinery was supplied by A. J. Corcoran, of New York.

OUR SPECIAL ILLUSTRATION.

ST. JAMES'S EPISCOPAL CHURCH.—R. H. ROBERTSON, ARCHITECT.

THIS church is built on a lot 150x75 feet, on a north-easterly corner of Madison Avenue. It is of English Gothic, with slate roof. The tower, 170 feet in height, is still to be erected. The architect is Mr. R. H. Robertson, of New York City.

WATER-WASTE PREVENTION AND PLUMBING APPLIANCES.

MR. RODERICK A. F. A. COYNE, the superintendent of the water-works at Edinburgh, recently read a paper on "Water-Waste-Preventing Apparatus in Connection with the Consideration of Waste-Prevention Measures," before the Royal Scottish Society. The following is a full abstract of the paper, which will be found suggestive reading. His long experience entitles his views to consideration.

It is not intended to take up your time by enlarging on the importance of economy in the use of water. The domestic arrangements of the present phase of civilization demand an abundant supply, and the copious use of that important element.

The history of the various water-supply undertakings that have been gone into since the year 1681 (when the Comiston Springs were introduced for the supply of the city), to meet the constantly increasing requirements of the domestic, and the no less important service to manufacturing up to the present, shows that it is no small matter to provide for our growing demand.

In an extensive system of water-supply such as ours, the checking and prevention of waste from all sources is of paramount importance; hence, the best attention of those

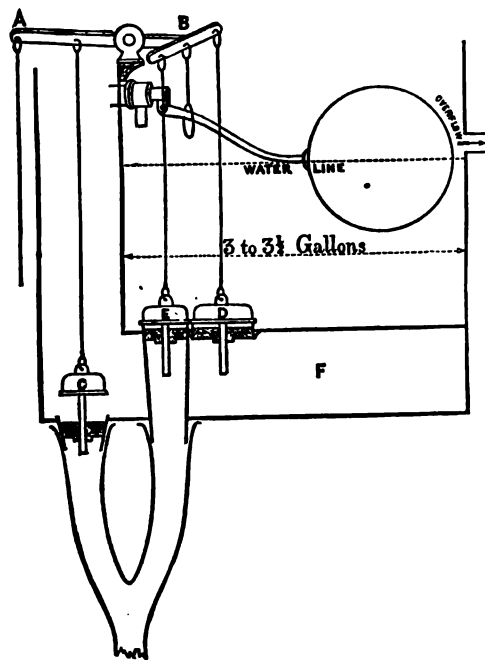


FIG. 1.

charged with the supply and its distribution should be directed to the suppression of waste. There are various sources of waste—(1) from apparatus out of repair; (2) from faulty apparatus and apparatus so constructed and contrived as to be likely to waste; (3) from leaky and bad pipes of all sorts, and (4) from the willful or negligent waste caused by parties leaving their apparatus open and deliberately propping up the water-closet handles.

The water-supply authorities have ample power under their Acts of Parliament to deal with every phase of waste, and to prohibit the use of any apparatus "that tends to waste" or to the "misuse of water." Faulty apparatus or apparatus out of repair, and burst or leaky pipes, can be detected and the waste stopped, but it requires more special and stringent methods to deal with waste from badly-constructed or contrived apparatus in old and poor property, and with the mischievous and reprehensible practice of tying and propping up the handles of water-closets.

During the last twenty-five years there has been an extraordinary increase in the consumption and uses to which water is being put. Almost a revolution in the sanitary arrangements of dwelling-houses, in regard to the introduction of hot-water appliances, baths, etc., and a vast increase in the number of water-closet apparatus of an inferior kind have taken place. The inefficiency of the means adopted to flush away soil and prevent the ingress

of foul gases has not only increased the waste from badly-contrived apparatus, but it is the prevailing excuse for tying or propping up the water-closet handle. Indeed, the extent to which the evil is practiced is so great as to demand the most serious and earnest attention of water-supply corporations, and all who justly value the blessing of a good and abundant water-supply. The practice is difficult to detect, and hence there is little hope of eradicating the habit, except by changing the mode of unlimited (and in many cases inadequate) flush for the closet to a limited but

abundant flush, which will at the same time increase the efficiency of the sanitary work done in cleansing soil-pipes and drains. Those who indulge in this mischievous habit of tying up the water-closet handle are doubtless not aware that they are taking the most direct method of allowing the drain gases free access into their houses, and are thereby endangering their own health, and frequently depriving their neighbors of their water-supply, besides criminally wasting it. We would naturally think that this sort of thing would only be done by the ignorant and less enlight-

TEST OF MATERIAL FOR THE ELECTRIC SUBWAY IN NEW YORK.—SEE PAGE 345.

TESTS BY TRANSVERSE LOADING ON SUPPORTS TWO FEET APART.

NAME OF MANUFACTURER.	Mark on Sample.	DESCRIPTION.	Depth, inches.	Width, inches.	Total breaking weight applied at centre, lbs.	Max. strain per sq. in. at exterior (by formula), lbs.
NEUCHÂTEL ASPHALTE CO., H. R. Bradbury, Agt.	No. 1.	Prism of rock asphalt mastic, made of their ordinary mixture for floors, etc., of Val de Travers (Neuchâtel) mastic, Trinidad bitumen grit, and sand.	5.6	6.51	4,000	706
	No. 2.	Prism made of Val de Travers rock asphalt mastic, 270 lbs; sand, 257 lbs; Portland cement, 35 lbs; refined Trinidad asphalt, 63 lbs. After turning into the pail the temperature was 387° Fah.	5.9	6.43	5,103	820
NEW YORK MASTIC CO., E. H. Wooten.	"A"	Prism of rock asphalt mastic, made of Seyssel mastic, 55 per cent.; fine gravel, 35 per cent.; bitumen, 10 per cent.	5.94	6.26	4,800	782
	"D"	Prism of Seyssel mastic, 35 per cent.; fine gravel, 55 per cent.; refined Trinidad bitumen, 5 per cent.; Portland cement, 3 per cent.; sulphur, 2 per cent.	5.82	6.04	4,140	708
DORSETT CONDUIT CO.	D ₁	Prism of coal tar pitch mastic, made of 80 parts sand, 20 parts coal tar pitch, and a little oil and manganese.	5.9	6.	3,780	652
	D ₂	By analysis, 78 parts sand and gravel, 17½ parts pitch, and 4½ parts oil and manganese.	5.9	5.9	4,460	782
BARBER ASPHALT CO.	1B	Prism of Butler's patent bituminous mixture, made of double refined Trinidad bitumen (épurée), 130 parts; paraffine, 5 parts; broken and powdered stone, mixed, 6 parts; silicious sand, 80 parts; wood fibre, 50 parts.	6.	6.	4,380	730
	2G	Trinidad asphalt, 30 parts; sand, 45 parts; broken stone, 45 parts.	5.91	6.	2,260	380
BOLZE.	1	Prism of Limer rock asphalt mastic, composition not known.	6.	6.01	4,200	698
HERMAN POOLE.	1	Prism of "Ferroid," consisting principally of sulphur and sulphide of iron.	6.31	6.01	1,580	238
	2	Prism of "Ferroid," consisting principally of sulphur and sulphide of iron.	5.72	6.32	4,720	822
JOHN THOMPSON, (Engineer of Commission.)		Rock asphalt mastic, composition not known.	6.5	5.9	2,020	292
BARBER ASPHALT CO.	G ₁	Section of conduit made from same mixture as 2G above, with four longitudinal holes, 2 inches in diameter.	6.8	6.8	1,850	290 approximately
	G ₂	Section of conduit made from same mixture as 1B above, with four longitudinal holes, 2 inches in diameter.	6.8	6.9	4,960	690 approximately
DORSETT ASPHALT CO.	D	Section of conduit made from same mixture as D ₁ above, with ten longitudinal holes, 2 inches in diameter.	7.9	15.8	12,280	908 approximately
RICHARDSON.		Section of conduit made from hydraulic cement concrete, with ribs top and bottom, and two longitudinal holes, each 2½ and 1½ inches diameter; supports 20 inches apart.	9.	7.	3,299	....

TENSILE TESTS.

					Per sq. in., lbs.
DORSETT ASPHALT CO.	D	Made of same mixture as D ₁ above.	.....	.....	514
CONTINENTAL CONDUIT CO.	.....	Grant's patent mixture.	.....	.....	497

CRUSHING TESTS.

NAME OF MANUFACTURER.	Mark on Sample.	DESCRIPTION.	Depth, in.	Lateral dimensions, diameter, inches.	Area, sq. in.	Total load at crushing, lbs.	Crushing test per sq. in., lbs.
WEST INDIA ASPHALT CO.	.....	Cylinder of bituminous mastic concrete, made of 30 per cent. Pédernales bituminous (from about 100 miles from Trinidad), and 70 per cent. coarse sand.	1.415	2.095	3.742	11,320	3,025
DORSETT ASPHALT CO.	No. 1.	Cube of same composition as D ₁ in Transverse Tests.	2.065	2.045 x 2.135	4.366	18,500	4,235
	No. 2.	Cube of same composition as D ₁ in Transverse Tests.	2.098	2.120 x 2.065	4.378	20,110	4,591
NEUCHÂTEL ASPHALT CO.	No. 1.	Cube of same mixture as No. 2 of Transverse Tests.	2.	2.035 x 2.025	4.121	4,900	1,190
	No. 2.	Cube made of Val de Travers rock asphalt mastic, 270 lbs; sand, 240 lbs; Portland cement, 54 lbs; Trinidad asphalt, refined, 45 lbs. Temperature in the pail 380° Fah.	2.045	2.060 x 2.045	4.213	9,730	2,311
NEW YORK MASTIC CO.	"A"	(Cube) same as "A" in Transverse Tests.	1.925	2.110 x 2.	4.220	3,700	877
	"B"	Cube from mixture of Seyssel rock asphalt mastic, 50 per cent.; fine gravel, 40 per cent.; bitumen, 5 per cent.; refined Trinidad bitumen, 5 per cent.	1.950	2. x 2.145	4.290	20,710	4,828
	"C"	Cube from mixture of Seyssel mastic, 40 per cent.; fine gravel, 45 per cent.; refined Trinidad bitumen, 7 per cent.; Portland cement, 2 per cent.; sulphur, 1 per cent.	1.960	2.120 x 2.145	4.547	14,800	3,253
	"D"	Same as D in Transverse Tests.	1.900	2.145 x 2	4.290	14,450	3,369
BARBER ASPHALT CO.	G ₁	Cube of the same mixture as 2G in Transverse Tests.	2.	1.950 x 1.985	3.871	3,560	920
	G ₂	Cube of the same mixture as 2G in Transverse Tests.	1.940	1.995 x 2.015	4.020	3,870	963
	B ₁	Cube of the same mixture as 1B in Transverse Tests.	1.995	2. x 2.020	4.040	6,600	1,634
	B ₂	Cube of the same mixture as 1B in Transverse Tests.	1.960	1.975 x 1.935	3.920	6,470	1,651
BOLZE.	No. 1.	Cube of the same mixture as No. 1 Bolze in Transverse Tests.	2.975	3.060 x 3.025	9.256	7,290	787
	No. 2.	Cube of the same mixture as No. 1 Bolze in Transverse Tests.	3.060	3.015 x 3.045	9.181	7,110	774
HERMAN POOLE.	.....	Cube of "Ferroid."	1.975	2.025 x 2.020	4.090	22,250	5,440
J. MCINTYRE.	.....	Block "Carbone Concrete," made of coal ashes and tar, mixed and molded, and then burned in a furnace until all volatile matter is burned out.	2.515	9.315 x 8.750	34.256	104,800	3,058
DORSETT ASPHALT CO.	.....	Part section of conduit as described before. Crushed on edge.	15.8	7.9 x 19.	.....	59,210	.....

ened portion of the community, but we are sorry to say, however, that the practice is not confined to these alone—it is indulged in by ladies and gentlemen of position and education, and advised and practiced by some medical doctors.

If we are to have water-closets in our dwellings connected to a system of drains, as at present, it is necessary not only that the connections be properly trapped, but that the soil-pipe be properly flushed. To do this effectively is not so much a question of the quantity of water used as the manner or mode in which it is applied. One moment's thought will show that a soil-pipe, if laid in a partially horizontal position, or in a very flat gradient, can only be cleansed when fully charged with water. It matters little *how many* gallons are discharged into it, but it does matter very much *how* they are *delivered*. Whatever mode discharges a given quantity of water in the shortest period of time, and in a compact body, that mode is undoubtedly the best, and will perform the maximum amount of sanitary work with an expenditure of a minimum quantity of water.

The Bramah water-closet, tried by this test, is unquestionably the best that we know of, and if the outlet-valve at the bottom of the basin were of equal diameter to that of the soil-pipe to which it is connected, we can scarcely imagine a more efficient or effective contrivance, for if the basin contains 2 gallons of water, and that quantity instantly discharged (it is discharged in half a second) into a 4-inch soil-pipe, it will fill about 44 inches of the pipe, and this flush, on entering the 6-inch drain-pipe, will charge about 19 inches of that pipe. If, therefore, we take the weight of the flush to be 20 pounds, and the fall from the closet to the drain to be 10 feet or 20 feet, or whatever the height may be, it is easy to calculate the momentum with which it will pass into the drain, and few will doubt its power to do its work efficiently.

The cistern (Fig. 1), specially designed for use in con-

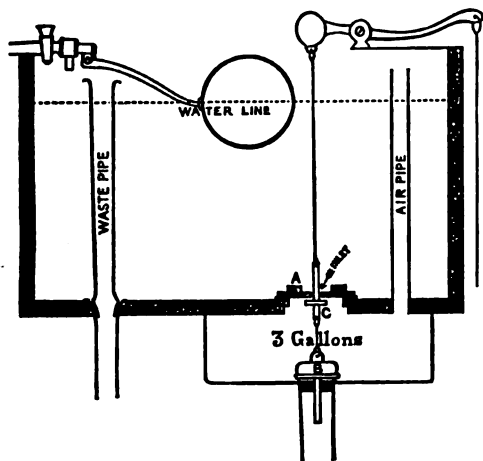


FIG. 2.

nection with the Bramah closet, has two compartments. The upper one contains from 3 to 3½ gallons of water, and the lower one, F (now empty), will contain 2 gallons. When the closet-handle is lifted the lever is depressed at A, and the other end of the lever at B opens the two valves D and E in the upper compartment. The valve D being of large area, immediately fills the lower compartment F, and the valve E communicating with the closet-basin simultaneously discharges the remaining gallon or gallon and a half into the now open basin for the purpose of washing its surface. The depression of the lever at A not only opened the two valves D and E in the upper compartment, but also closed the valve at C. When the closet handle is put down, and the lever restored to its original position, it raises the valve at C and discharges the contents (2 gallons) of the compartment F into the basin, where it is retained ready for use again. The operation is that of raising up and putting down the closet-handle, the flushing, cleansing, and refilling the basin, and the time involved does not exceed three or four seconds. The movement of the lever A effectually shuts off the water at the ball-cock, and thus prevents any more than the regulated quantity of 3 or 3½ gallons being used at each use of the closet. The time required to allow the cistern to fill can be adjusted by a diminished inlet in the ball-cock to suit the pressure in the service-pipe to which it is attached.

Figure 2. This represents an ordinary cistern, and the method adopted is to place a service-box of a capacity of 3 gallons under it, and it differs only from the ordinary service-box in its capacity and adjustment of valves. We have in this method placed the discharge-valve on the outlet-pipe of the compartment. The inlet is also protected

by a small valve C, opening downward, which is connected to the under valve B, and is so adjusted that when the under valve B is open the small upper one C is shut, and *vice versa*. Access to the valve is obtained by unscrewing a brass or gun-metal plate A, in the bottom of the cistern. This access is sufficiently large to allow a man's hand to get in. This compartment stands full and ready for use, and the time to allow it to fill can be regulated by the difference in the diameter of the spindle which carries the small valve and that of the hole in which it works. The contents of the compartment are discharged in about three seconds, and the flush is very efficient. The 3 gallons will charge 66 inches of a 4-inch soil-pipe, and on reaching the 6-inch drain-pipe they will charge 29 inches of that pipe, thus the sanitary work done is most complete.

Figure 3. Let us suppose that we are substituting a "wash-out" or any of the types of "hopper-closets" presently in use for a common "pan-closet," and the cistern which formerly supplied it remains where it was, the first thing we have to consider is the supply-pipe between the cistern and the closet. The old style of supplying the closet by a ¾-inch or at most 1-inch pipe is perfectly useless—nothing less than a 1½-inch pipe ought ever to be used. This adjusted, and a valve of at least corresponding diameter put into the cistern, the easiest and cheapest method of providing a limited flush is to place a compartment into the cistern which will contain 3 gallons. This compartment is placed over the valve, and consists of a sheet of 5-pound lead soldered to the bottom and sides of the cistern. A small hole of about ¼ inch is pierced in it near the bottom, so that it will fill in about three minutes. This plan, however, has one disadvantage—viz., if the water should be off for repairs or a burst pipe, circumstances which frequently occur, each succeeding flush would be less than the former one as the level of

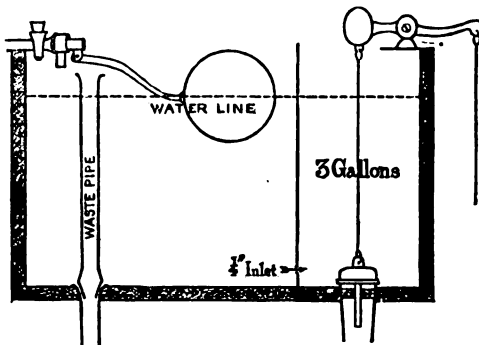


FIG. 3.

the water sinks in the cistern. This objection, however, cannot be urged against the plan recommended in Fig. 2.

At present the great majority of houses in the city are fitted up with some form of valve-closet or the common pan supplied by a ¾-inch pipe between it and the cistern. A very poor and inadequate flush is thus obtained. The great want which prevailed for a long time of a good and cheap sanitary closet, simple in structure, and consequently not liable to go out of order, having no surface exposed to passing soil but what is visible and easily kept clean, is now so far supplied in the various types of wash-outs and hopper-basins. If these modern and sanitary closets were introduced, and provided with any of the flushing methods shown at Figs. 2 and 3, the practice of holding, tying, or propping up the closet-handle would forever cease, and an enormous saving in the consumption of water would thus be effected. We are ourselves satisfied that at least there would be a saving of 5 gallons per head of the population, and this at 3d. per 1,000 gallons would represent £6,845 per annum.

But this is a very moderate estimate to place against such waste, as the sequel will show. We have tested the consumption by meters placed on the supply-pipes to the various types of houses from £4 of annual rent to £280 throughout the city and district, and the result is appalling.

(1). We began with a tenement in the district of the Pleasance, from which complaints of want of water had come in. On an inquiry being made as to the cause, all the apparatus and the service-pipes were found good. It was, however, suspected that some of the tenants were leaving water-closet or closets open all night and into the early morning, but it proved impossible to detect the party who did so. A test-meter was put on for a period of 82 days, with the result that the consumption was found to be from 20½ to 51½ gallons per head per day to each inmate of the tenement. The rental of the houses is from £14

to £18. The cistern accommodations are placed in the attics, and are common to all the tenants, affording them about 14 gallons per head.

(2) Similar complaints came from the district of Norton Place, where the cisterns are in the attics, and on an inquiry and examination being instituted the result was the same. The test-meter was put on for the period of 88 days, and the consumption was found to range from 30 to 58 gallons per head per day to the inmates. The rental of the houses is from £25 to £29.

(3) A tenement in Leith, consisting of nineteen houses, was examined. The rentals range from £4 to £10. There are two cisterns in the attic, nineteen water-closets, and nineteen sinks. It was found impossible to detect the party who, it is certain, was wasting the water by having the handle of the water-closet fastened up. A test-meter was put on, and after a test of 80 days the consumption was found to run from 37 to 58½ gallons per head per day, the average for the whole time being 49 gallons.

(4) The district of Viewforth was next brought under our notice by a party who stated that he could not sleep owing to the constant rushing noise of the water in the next house. All the water apparatus were found good, and all efforts to catch the person who was evidently leaving his closet open all night failed. A test-meter was put on for a period of 65 days, with the result that the consumption was found to be from 50 to 87 gallons per head per day. There were bath and hot-water appliances in this house. The rental was £50.

(5) The Grange District.—Some of the mansions in this district were put under test-meter for a period of 33 to 46 days, with the result that the consumption was found to range from 46 to 126 gallons per head per day—all washing given out—rentals £180 to £280.

(6) Houses in the west end were put under test-meter for 80 days, and the consumption was found to be from 46 to 96 gallons per head per day of the inmates—all washing given out.

(7) In the district of Ainslie Place and Moray Place some houses were tested, and the consumption was found to run from 44 to 119 gallons per head of the inmates—all the washing given out—rentals from £200 to £210.

(8) Dean District.—Some of the houses in this quarter were put under test-meter for a period of 80 days, and the consumption was found to be from 56 to 111 gallons per head per day—all washing given out—rentals from £130 to £170.

(9) Trinity and North Leith.—Some houses in this quarter were put under test-meter for a period of 80 days, with the result that the consumption was found to be 34, 56, 64, 111, 120, and 426 gallons per head per day. Only once was the consumption so low as 34 gallons—all washing given out—rental about £140. The average consumption was 74.4 gallons per head per day.

(10) South Leith.—A test-meter was applied to some of the houses in this quarter for 20 days. The rentals ranged from £80 to £120. The consumption was found to be from 39 to 66.6 gallons per head per day—washing done in the houses.

All pipes and apparatus in the foregoing were found to be in first-rate order.

Another class of waste is from water-closets supplied off the main, without the intervention of a cistern. Two water-closets in the district of the Dean were found to be wasting 30,000 gallons in the twenty-four hours. Three water-closets in the district of Lauriston were found wasting 12,000 gallons per hour; and seven water-closets wasted over 40,000 gallons in twenty-four hours in the Dalry district.

After these revelations, it is perfectly evident that something must be done to check this evil, and it has long been recognized by the water-supplying corporations of the country that the only method of dealing with it is to compel the introduction of waste-preventing apparatus—apparatus which will thoroughly flush the closet, but which cannot be easily used so as to waste water. The limited flush, as it is called, has this double advantage of both doing its work well and preventing willful waste, as few people have time or would care to stand two or three minutes waiting in order to repeat the flush.

In advocating a limited flush for all and every kind of water-closet, we have been frequently met with the reply, "You may provide a 'wash-out' with a limited flush, but you cannot do so with a Bramah or a common pan-closet." If we ask why, we are generally told that it is impossible to do it, as the whole amount of water provided might be discharged while the closet is open, and leave none to fill the

basin. In the apparatus before you this difficulty is easily and successfully overcome. Others maintain that the "Bramah" must have a flush of 4, 5, or even 6 gallons. Nothing can be more absurd than the latter contention, as the "Bramah" of all closets can do its work well with little water; indeed, it really requires no more water than will fill the basin, provided the soil-pipe is properly ventilated to prevent the trap from being syphoned; and even allowing for all possibilities the Bramah is fully and more than sufficiently supplied with 3 gallons when properly applied, but $3\frac{1}{2}$ gallons would be a redundancy.

The advantages of the contrivances for flushing the Bramah water-closet now before you are, simplicity of structure, accessibility of all parts, and certainty of action. There is nothing connected with it but any workman can see and understand at a glance, and there is no special material or fitting which any plumber has not at hand. Its efficiency is at once apparent: immediately after the discharge of the contents of the water-closet basin, the cistern delivers one gallon or a gallon and a half, which washes the basin, and fills the trap. If, however, it should be syphoned by the action of the water which has just passed from the basin, when the closet-handle is put down the after-flush (2 gallons) fills the basin above the overflow, charges the small trap connected with it, and secures the seal of the 4-inch trap.

The two methods illustrated in Figs. 2 and 3 have the great advantage of being easily applied to existing cisterns, when they are near the water-closet, and the flush obtained from either of them is most efficient.

We have obtained copies of the printed rules and regulations enforced by the water-supply authorities in the principal cities and towns in the United Kingdom, and in each the supply to the water-closet "must be from a cistern fitted with an efficient water-waste-preventing apparatus, so constructed as not to be capable of discharging more than two gallons of water to each flush, and so that it cannot be made to flow continuously either by intention or neglect."

In Edinburgh, however, we would be willing to allow and recommend 3 gallons to each flush (and in the case of the Bramah 3 or $3\frac{1}{2}$ gallons), and by this liberal and almost superabundant flush we would be sure that soil-pipes would be thoroughly flushed, and besides, that there would be an enormous economy in the consumption for water-closet purposes as compared with that which prevails under the present system throughout the city and district.

Long experience has proved in London, Manchester, Norwich, Leeds, Bradford, Huddersfield, Glasgow, and Dublin, that the limited flush is the only possible remedy for preventing the great waste caused by fastening up water-closet handles.

A STRIKE OVER THE PLUMBERS' APPRENTICESHIP QUESTION IN NEW YORK.

DURING the last three or four days the journeymen employed in the leading shops in the city have been on a strike. The contest has been over the rules concerning apprentices, with which our readers are familiar. Plumbers who do their own work and employ not more than one man, so far as we can learn, are not specially affected. Those who have any large amount of work on hand, and employ a number of journeymen, are, of course, considerably inconvenienced.

The masters appear to be very sore over what they claim have been arbitrary acts of the leaders of the Journeymen's Union during the summer. The journeymen are reticent, and little can be learned from them. Their leader and walking delegate is absent attending a convention in Chicago.

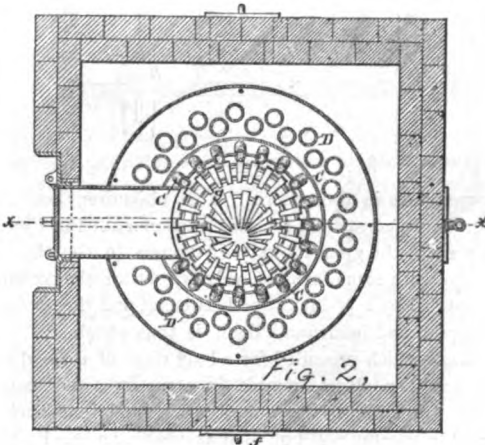
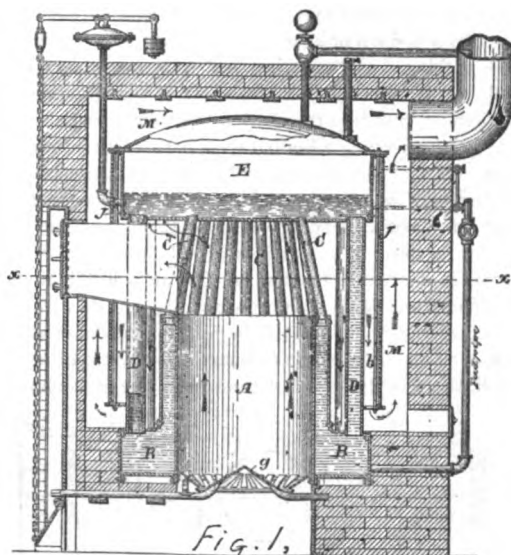
Novelties.

Under this heading we propose to describe and illustrate appliances of probable interest to our several classes of readers. The selection will be made without reference to the wishes of agents or patentees, being governed solely by considerations of novelty, ingenuity, and probable interest to readers, and especially the fact that they have not been elsewhere described. As a rule we shall make no comments, and it is to be distinctly understood that a notice does not imply approval. No charge will be made for these notices, and any offer of pay for their insertion will insure their omission. We shall be glad to have our attention called to novelties suitable for this section.

BOILER FOR HOUSE-WARMING APPARATUS.

THE accompanying drawings show a novel low-pressure or house-warming boiler lately patented by Robert S. Watson, of Bay City, Mich.

Figure 1 is a vertical central section (in a plane running from front to rear) of the steam-boiler or generator, and Fig. 2 is a horizontal section on a plane indicated by the line $x x$ of Fig. 1. A is the fire-box, surrounded by a water-jacket or space, B, of the form shown; E is the dome or uppermost portion of the boiler, in which the steam generated over the top surface of the contained water collects, and from which it passes off through the steam-pipe to supply the radiators. The dome is preferably cylindrical and has about the same diameter as that of the base portion B, and is located some distance above, as shown. Surrounding the thinner portion of the water-space or furnace B are a double series of tubes, D, the lower ends of which communicate with the base portion of the water-space B, and the upper ends with the dome E. Another series of pipes C, which also communicate at their upper ends with the dome E and at their lower ends with the upper portion of the fire-box, are arranged to converge at their upper ends so that the ascending products of combustion will impinge on the surfaces to a greater ex-

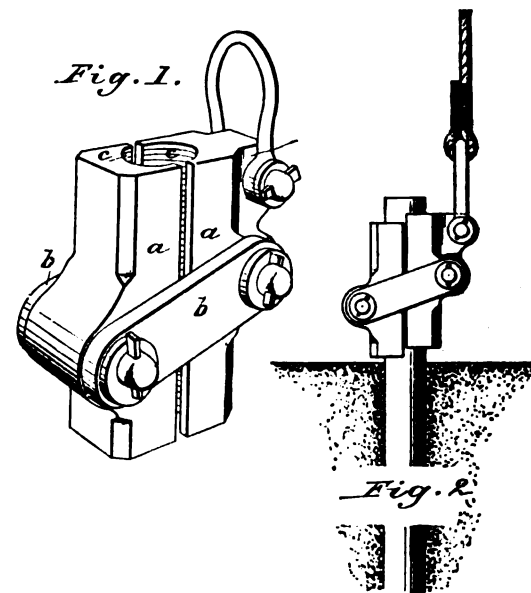


tent than if they were arranged vertically. A jacket, J, preferably a sheet-iron, cylindrical in form, and of a diameter a little greater than that of the dome portion E, is provided to force the products of combustion downward between the tubes D in its passage into the flue or space M. Said jacket has its upper edge arranged just beneath and in contact with the flanged annular rim a of the dome E. The arrows indicate the general direction of the currents of heat, and show that the products of combustion ascending from the fire strike against the under surface of the dome, passing between convergent tubes go in a partially horizontal direction toward the upper ends of the vertical tubes D, thence descend within the cylindrical jacket in contact with all the tubes and also in contact with the exterior wall of the thinner portion of the water-space D, after which the whole mass escapes outwardly beneath the jacket and thence passes upwardly within the brick-work to the chimney.

DEVICE FOR WITHDRAWING PIPES FROM DRIVEN WELLS.

THE accompanying cuts, Figs. 1 and 2, show a device for clutching the tube of a driven well for the purpose of withdrawing it from the ground and the method of applying it to the tube.

The grapple, Fig. 1, is composed of the two jaws $a a$, joined together by the link-plates $b b$ and pivots or pins. The jaws are concaved upon their inner faces, as shown at $c c$, so that the jaws will fit upon the opposite sides of a pipe, and the concaved surfaces are to be roughened or notched, as shown, to avoid slipping upon the pipe. The concaved surfaces of the jaws are also of less than half the circumference of the pipe to be lifted, so the edges of the



jaws will not meet around the pipe to prevent the jaws from grasping it.

When the clevis with the rope attached is lowered the jaw to which it is attached falls, or may be knocked from the pipe with a slight blow, bringing the link-plates into a horizontal position and thus forcing the jaws asunder so that they may drop for a new hold on the pipe.

It is the patent of James Mericles, of Patchogue, Long Island, N. Y.

Correspondence.

TREATMENT OF SEWAGE, AT LONDON, ENG.

NEW YORK, August 30, 1886.

SIR: In your July 29 issue, page 200, we notice, under the head of "Our British Correspondence," this statement that is likely to mislead engineers in the United States with regard to opinions which at present prevail in England on the question of sewage treatment by precipitation:

"The Metropolitan Board of Works and the Home Secretary, representing the Royal Commission on Metropolitan Sewage, are in disagreement. The former body is desirous of permanently adopting the system of treating the sewage by chemicals for precipitating and disintegrating purposes, whereas the Royal Commission condemns it."

Until within the past few years we are aware that precipitation schemes for the treatment of sewage did not meet with unqualified approval in England on account of the great difficulty in disposing of the deposited sludge, which, until lately, proved to be almost as great a difficulty as the pollution of the rivers which the precipitation schemes were designed to prevent; but this is in a great measure changed now since the introduction of the system of pressing the precipitated sludge into inodorous cakes of one-fifth the bulk, which has rendered it possible to dispose of the sludge without nuisance. The sludge from sewage precipitation-works hitherto has proved valueless in consequence of the great quantity of water present, diluting it to such an extent that it did not pay the cost of carriage to bring it on to the land, but by pressing in filter-presses it loses eight-ninths of its water, and in the pressed condition it is of much greater value as a fertilizer. These facts were brought before the Royal Commission on Metropolitan Sewage Discharge, referred to by your correspondent, but they so far from condemning a precipitation process for the treatment of the sewage of London have reported altogether in favor of this treatment, and have made it a *sine qua non* in their recommendations with which they conclude their report, no matter what else may be done with it afterward; and in support of this we quote from the report of the Royal Commission in question the first six of their conclusions and recommendations:

"The following is a summary of the conclusions we have arrived at and of the recommendations we make:

"(1) Our opinion of the evils described in our first report, as resulting from the present system under which sewage is discharged into the Thames by the Metropolitan Board of Works, is much strengthened, and we believe these evils imperatively demand a prompt remedy.

(2) "We are of opinion that it is neither necessary nor justifiable to discharge the sewage of the metropolis in its crude state into any part of the Thames.

"(3) We are of opinion that some process of deposition or precipitation should be used to separate the solid from the liquid portions of the sewage.

"(4) Such process may be conveniently and speedily applied at the two present main outfalls.

"(5) The solid matter deposited as sludge can be applied to the raising of low-lying lands, or burnt, or dug into land, or carried away to sea.

"(6) The entire processes of precipitation and dealing with the sludge can be, and must be, effected without substantial nuisance to the neighborhoods where they are carried on."

Metropolitan Boards of Works, London, have put up sludge-pressing machinery.

We are moved to ask your correction of this statement, because we are interested in building filter-presses for the treatment of sewage sludge, and if precipitation processes were condemned and not adopted where they are most desirable, our business interest would necessarily suffer; and as the London branch of our firm have constructed presses that have been dealing with one-twentieth of the London sewage, and the authorities are contemplating increasing the plant, we trust that you will make this correction, as we do not want to have our efforts to introduce this machinery in the United States handicapped by such an item from your London correspondent. We should have replied to this before, but wrote to England for the facts. Very respectfully,

JOHN JOHNSON & Co., Franklin Square, N. Y.

HOT AIR, HOT WATER, AND STEAM HEAT.

LEXINGTON, KY., August 12, 1886.

SIR: (1) We are considering the matter of heating the Opera-House here with steam or hot-air furnace and would like your advice as to which is best. It is quite a large building, with basement, and will seat about 1,200, situated on the first floor; there will be two galleries also. (2) Do you know of any opera-houses where hot air has not given satisfaction and where steam has been substituted for hot air? An early reply will oblige a

SUBSCRIBER.

[For an opera-house of the size and character of the one referred to steam-heating will give the most satisfactory results. The amount of air-supply required to secure a fair degree of comfort in such a building is large; probably not less than 2,000,000 cubic feet per hour will be needed, and it would be very difficult to arrange a system of furnaces so as to insure the proper distribution of this amount of air at a temperature suited to the audience. Experience has shown that this can be done by the use of steam-heated radiators, combined with mechanical means, such as a fan for forcing the air in, and with valves for regulating the temperature of the air admitted at different parts of the house, without interfering with the quantity of supply. All opera-houses in this country, so far as we know, have had steam-heating, and we know of but one in Europe that is heated by furnaces.]

HEATING CAPACITY OF STEAM-PIPES.

CLEVELAND, O., August 21, 1886.

SIR: Please give me an example, through the columns of your valuable paper, of how to find the heating capacity of the different size steam-pipe, from 1-inch to 2-inch, per foot, under ordinary low and high pressure steam.

There is a question raised on this point, and I would be pleased to have your authority on it.

By giving this information you will greatly oblige one of your subscribers.

A. A. PARKER.

[When the surrounding conditions are all the same, with the single exception of diameter of pipes from one to two inches, there is little or no difference in condensing pipes per square foot of surface when they are in the vertical position. When in the horizontal position, all other things being the same, the smaller pipes are the most efficient per square foot of surface, assuming the steam-pressure is kept constant. From about 200 to about 350 heat-units per square foot of surface is given off by steam-pipes in an atmosphere of 70° Fah., varying with the pressure of steam (being greater for greater pressures, of course), the angle of the pipe to the direction of the current (being greatest when the air passes the pipe at right

angles), and the size of the pipe—the condensation being somewhat greater for smaller sizes.

If you state your problem more clearly we will reply again.]

COMPARATIVE VALUE OF ONE-PIPE AND TWO-PIPE SYSTEMS OF STEAM-HEATING.

PROVIDENCE, R. I., August 27, 1886.

SIR: Will you give us your opinion of the comparative value of the one-pipe system and the two-pipe system of steam-heating, as to cost, rapidity of operation, as to circulation and effectiveness? Also, do you think that the so-called "Williams system," which is patented, is of any value when attached to a steam-heating plant where the pipes are well graded for drainage and are of proper size? Will it enable me to use smaller pipes and heat rooms below the level of the water in the boiler? Yours truly,

ARCHITECT.

[The saving in first cost of a one-pipe system over a two-pipe system, all other things being the same, is not ten per cent. of the whole cost of good work.

The two pipe system will heat much more rapidly than the one-pipe system when steam is turned on, but just how quickly depends largely on the care with which both systems are put in. In any case the difference is quite appreciable. The circulation of the one-pipe system is not as good as of the two-pipe system, and—other things being equal—it is always more noisy; in fact, it is impossible to make a one-pipe system that will not "water-hammer" through defective valves or ignorant manipulation. Their effectiveness is about equal for certain classes of heaters suitable for both systems, but while almost any heater will work well with a double pipe, only a few will work well or fairly well with a single-pipe system.

We can give no opinion as to the value of the "Williams system," as we do not know what is claimed. But the pumping of water of condensation out of the return-pipes of a heating apparatus has long been resorted to, as it is a common practice either with a pump or return-trap. When you use a pump or trap you can use somewhat smaller pipes than you would for a gravity apparatus, and rooms below the boiler can be warmed.]

THE PHILADELPHIA MASTER PLUMBERS' ASSOCIATION TRYING TO SECURE STRICT ENFORCEMENT OF THE PLUMBING LAW.

(From our Regular Correspondent.)

PHILADELPHIA, September 3, 1886.

THE first case of serious difference that has existed between the Board of Health and the plumbers of the city since the propagation of the new rules and regulations has just culminated in the procuring of a mandamus by two of the members of the Master Plumbers' Association, restraining temporarily the Board of Health from granting permission to private parties to violate the plumbing rules within the city.

The case in complaint is substantially as follows: A builder in the upper portion of the city averred that, owing to insufficient grade, it was impossible for him to conform to Rule 13 of the new law, which prohibits the laying of any private drain in yards of houses parallel to any street or alley. He averred that the grade was only 14 inches in some 300 feet, and the Committee on Plumbing and Ventilation granted him permission to violate the rule and proceed with the work, laying the drain through the yards of the houses and draining each house separately into the main drain.

As soon as the fact became known some of the plumbers loudly protested, and the Board of Directors of the Master Plumbers' Association sent in a formal protest to the board, and later the matter was brought to the attention of the Master Plumbers' Association at the August meeting, and another protest was ordered by the association with further instructions to the Board of Directors that in case the protest is not heeded counsel should be retained and the case tested in the civil courts.

A number of the members of the plumbers' association are very indignant that the board should discriminate in favor of a wealthy builder, and especially so after the surveys by both the representatives of the plumbers and of the Survey Department of the city have demonstrated enough fall to fill the demand of the Survey Department in the construction of city sewers.

The question whether the board has the power to violate the promulgated rules has been raised, and to test this the present case has been submitted as a test one to the courts.

CHICAGO MASTER PLUMBERS ON CONNECTIONS BETWEEN IRON PIPES AND EARTHEN HOUSE-DRAINS.

(From our Regular Correspondent.)

CHICAGO, September 2, 1886.

THE Chicago Master Plumbers' Association met September 1, T. C. Boyd in the chair. Besides routine business, including the election of several new members, some interesting remarks by Mr. W. H. Genting, Chief Inspector of the City Health Department, received attention. Not long ago a municipal ordinance was passed, to the effect that "the connection between metal pipe and house-drain" must be made "as the Commissioner of Health shall direct," and Mr. Genting's remarks were made at the formal request of the plumbers, and as an exposition of Commissioner De Wolf's policy in the matter. Mr. Genting said that it had been decided to "use Monteth's cap and joint until something better was found," and talk it with oakum and lead. He talked quite a while of the new law which the Chicago architects desire to have passed, relating to the same subject and providing for the use of "the quarter-bend." The Health Department desired to work in harmony with the plumbers, and Mr. Genting desired to know the preferences of the meeting. The response was a vote, by a large majority, to use the Monteth cap, it being agreed that the old-style cement connection was porous and responsible for most of the sewer-gas that got into buildings. After voting thanks for the lucid lecture and its blackboard illustrations, the meeting learned from Treasurer Hamblin that the balance in the treasury, August 31, was \$380.40, and the membership 159.

ASBURY PARK, N. J., WATER-TOWER.

IN our description of the water-works at Asbury Park, N. J., last week, the seventh of our series under the title of "Recent Water-Works Construction," we inadvertently neglected to mention the following gentlemen, as is our custom in these descriptions: The contractors were R. Tippet's Sons, of Harrisburg, Pa.; engineer in charge, J. H. Yocum, of Camden, N. J.; and the pumps were built by the Holly Manufacturing Company, of Lockport, N. Y.

FORCING SEWAGE INTO THE EARTH.

ONE of our Rochester contemporaries has been wasting its space in considering a proposition of a correspondent to dispose of the city sewage by "forcing it into the earth one thousand feet down, drilling deep wells and forcing the sewage in by pumps." We have been asked to comment on the proposition. Our comment is that the idea is so preposterous that no one but a crank could think of it, and no one but a newspaper reporter would dwell on it.

LITIGATION OVER IRRIGATION.

MR. ANDERSON, Engineer of the Platte Land Company, desires us to make a small correction of our article on "Irrigation," page 226, issue of August 5. The litigation spoken of is not respecting the payment of the yearly rental of \$1.50 per acre, which is paid by all, whether the land is bought of the company or not. Those buying land of others than the company raise the claim, which is the matter in litigation, that it is illegal to charge them a fixed sum (in addition to the yearly rental) for the "privilege to water." The water privilege is included in the price fixed for the land to those buying land of the company, and is the chief element in its value.

THE MITIS PROCESS OF PRODUCING WROUGHT-IRON AND STEEL CASTINGS.

THIS is a pamphlet-compilation by W. F. Durfee, for the information of the public, from several papers on the subject that have appeared in the technical journals. The difficulties experienced in casting wrought iron and steel have been chiefly those arising from the attempt to raise the temperature above the melting point sufficiently to enable casting to be done before chilling begun. This is remedied by the addition just at the melting point of these metals of one-tenth to one-twentieth of one per cent. of aluminum. The alloy thus formed has a melting point from 300 to 500 degrees less than the pure iron or steel; and the castings made, it is claimed, are very strong and smooth. Special furnaces have been adopted, and special methods of molding. As the process is now being introduced here the practical results will be looked for with interest.

AN ARTESIAN WELL SPOUTS TOO SOON.

A DISPATCH to the *Chicago Tribune* thus describes the recent freak of an artesian well at Belle Plaine, Iowa. This mishap has been attributed to the influence of the recent earthquake shocks, but seems to be due to inadequate precautions on the part of the well-digger:

"The great artesian well continues to spout forth volumes of water. The engineers have been actively at work all day, and still express the hope that they will soon have the flow of water under control. The correct story of the outbreak is as follows: William Weir, of Belle Plaine, contracted to make an artesian well at this crossing, the well to have 3-inch casing and a guaranteed flow of water. Weir had successfully bored two similar wells during the summer in other parts of the town. Another contractor named Palmer had bored four similar wells with equal success, and all six wells had a steady flow of water with a surface-pressure of eighteen to twenty-five pounds to the square inch. Weir began work on the new well last Monday week, and the following Thursday struck water at a depth of 193 feet, or about forty to fifty feet nearer the surface than it had been found in any of the other borings. Weir had bored a 2-inch hole, believing that the flow of water would wash it out large enough for a 3-inch casing. The water rose in a solid stream twelve feet above the surface. Friday while Weir was attempting to force the 3-inch tube down the 2-inch hole the water forced its way up outside the casing and the hole rapidly widened at the surface. The casing was then forced down to a depth of 120 feet, but the outflow outside the casing rapidly increased and the torrent became unmanageable. Friday night a solid stream of water a foot in diameter was pouring out and spreading in every direction. Weir threw up his hands in despair and dropped the job. The city authorities then took the matter in hand, and kept a gang of men at work most of the night banking in the water so that it flowed in two rivers, east and west on Washington street. Saturday morning the hole was a yard wide, and the water rising four feet above the surface. The water was thick with sand, and it was impossible to keep the flood from inundating the adjacent lots, the heavy deposit of sand raising a mound from which the water flowed in every direction. Eugene Palmer, a local engineer and contractor, proposed driving a 15-inch casing down the hole, hoping that when the stratum of blue clay sixty feet below was reached the water would be confined to the casing so that the outside flow could be stopped. He was given orders to proceed with the work. The hole was walled in with heavy planks, two openings being left for the outflowing rivers. A huge derrick was erected over the hole. The county bridge workmen came with their pile-driver and other bridge apparatus to help the work. The great tube was hoisted and easily forced down forty-five feet. By hard work with the pile-driver it was eventually driven down eighty feet, leaving five feet sticking above the surface. The water still poured out all around the tube as well as through it, but the supply of tubing was exhausted and work had to stop. By this time all the other wells in the town had ceased flowing. The big tube gradually sank of its own weight, so that Wednesday night the top of it was sixty feet below the surface. This scheme having therefore failed to diminish the outflow a new scheme was devised. This was to sink a 3-inch tube, with cording wrapped around it in the form of a cone, twelve inches in diameter at its largest part, down through the large tube already inserted. This plan was carried out, but without any perceptible effect. Then a new plan was devised—namely, to sink a 5-inch casing with heavy iron cones on it twenty feet long and thirty inches in diameter at their widest part. A 2-inch tube to serve as a guide for the cone-tube was then sunk and bottom reached at a depth of 210 feet. Thursday last a cone weighing over a ton was ready, and was inserted about noon. At seven o'clock it had been sunk to a depth of sixty-two feet, but the utmost efforts failed to get it lower, and the belief was that its point rested on the upper edge of the 15-inch casing first put down. The flow was still as big as ever, but did not seem so violent owing to the increased size of the aperture at the surface. There is now no chance of any further damage, as Washington Street has been turned into the bed of a stream to prevent any overflow on the surrounding property. Until the hole is closed up or gotten under control this street is practically blockaded, and Beech Street is almost as bad. There is still some fear that the upper crust will cave in, which would leave a hole on the crossing about twenty-five feet in diameter, and probably thirty feet deep."

Reviews of Books and Pamphlets.

BIENNIAL REPORT OF THE BOARD OF HEALTH OF THE STATE OF LOUISIANA. 1884-85. 157 pp., 8vo. Baton Rouge. 1886.

This report, prepared by the president of the board, Dr. Joseph Holt, commences with a historical sketch of the work of the board since its reorganization in April, 1884, giving a detailed account of the methods of maritime sanitation adopted by it as a substitute for the detention methods of quarantine. The fundamental idea involved in this is undoubtedly correct—namely, that the mere detention of an infected yellow-fever ship has no tendency to diminish the danger from it unless such detention lasts until cold weather has set in, which simply means non-intercourse, and that if thorough cleansing and disinfection of the vessel can be secured this is sufficient to prevent danger from it.

The disinfecting agent used by the New Orleans board is sulphurous-acid gas, to which is added the washing of exposed surfaces with a solution of bichloride of mercury.

The reporter objects to the National Board of Health on commercial and States rights grounds, but does not seem to us to make out a good case.

In an appendix is given the history of the litigation between the Morgan line and the Board of Health with regard to the payment of quarantine fees, which has been concluded by a decision of the Supreme Court in May last in favor of the board.

The greater part of the volume is occupied with data relating to the city of New Orleans, the Louisiana board being also the municipal board of the city.

The total number of deaths registered was, for 1884, 7,150, and for 1885, 6,673, giving death-rates of 31.43 and 28.50 respectively per 1,000 of population. The mean population for 1885 is given as 234,000. The distinction of color is not given in the death-rates.

In speaking of the drainage and paving of the city the author says: "The faulty conditions of banquets and streets is apparent at every step along even the most improved portions of our city. A large area of the city has been paved with 'square-block' granite or 'cobblestones,' but, except at street-crossings or under bridges at these intersections, a clearly-defined street-gutter is the exception. This condition, associated with faulty grading, gives rise to the following: After a heavy rain the water from the streets, yards, and housetops starts in the direction of a lower grade, spreads over the streets, and, when these are high, overflows the adjacent banquets, meets with an obstruction at the first cross-street, where a faulty constructed bridge and inadequate outlet confines its volume and retards its flow. Passing under this bridge it now spreads over the street below, which is dished so as to allow its encroachment, its current is by physical law lessened, laden with organic and inorganic impurities, the surcharged water deposits these, and its progress to the drainage-canal is characterized by alternate contraction at street-crossings and expansion on streets and banquets between these intersections."

"The paved streets are invariably constructed, except at the intersection with cross-streets and at the wings of bridges, with a confirmed arch, so abrupt in many instances as to prevent riding or driving except at their crown. Thus wear and tear are confined principally to the middle of the street. This arch has been intentionally formed under the mistaken opinion that the character of our soil was such as not to support the paving material except when the lateral pressure of stone against stone made a support. That this reason admits of serious question is proved by noting the condition of paved streets where at intersections with cross-streets almost a dead level is sustained. It is rare to find repairs necessary at such locations, but where the arch is in all its symmetry repairs are frequently required. Street-car lines destroy these arches, but it is where the stones are faultily replaced without proper preparation of the foundation that irregularities are observed. * * * Paving streets with shells has proved that this material requires great care when being put into position. The foundations are often faulty, and trituration by vehicles wear the road rapidly, and nothing short of a large quantity of material is required to replace that ground into dust and blown away. Constant surveillance and frequent repair are essential to perfection as far as can be obtained with this class of street. Left to themselves, or given the usual care by the authorities, they are short-lived and undesirable."

ANNUAL REPORT OF THE DEPARTMENT OF HEALTH OF THE CITY OF BROOKLYN, for the year 1885. 202 pp., 8vo. Brooklyn. 1886.

This is the most interesting and valuable municipal sanitary report which we have seen for a long time, and its author, Dr. J. H. Raymond, the Commissioner of Health, is to be congratulated, not only on the amount of work done, but also upon the manner in which he has reported it.

Estimating the population of Brooklyn at 700,000, the death-rate for 1885 was 21.95, or, in round numbers, 22 per 1,000. This is higher than the rates of London and Philadelphia, and lower than those of other large cities. The account of work done in filling of ponds, removal of filth, discouragement of privy-vaults, etc., is mainly of local interest, but is the sort of information and advice which should be given in such a report. All the public wells in Brooklyn with one exception are now closed and abandoned as sources of water-supply. Dr. Raymond expresses his belief that no single measure which has ever been carried out in the city will contribute more to the maintenance of the public health than this.

The special feature of the report is Appendix A, containing reports on chemical analyses, etc., made in connection with the inspections of food-supply, water, milk, etc., etc., by the Chief Chemist, Dr. E. H. Bartley, and by chemists W. H. Kent and Otto Grothe. These cannot be summarized, but we would call attention to the section on gelatine in foods, more especially in ice-cream, on lager-beer and the methods of its manufacture and preservation, on the food preservatives called "rex magnus," and "venetian red," on soda-water apparatus, and on fruits and jellies put up in unsealed tin cans or pails.

The account of the experiments made in burning sulphur in closed rooms, and the effects produced by it on the texture and color of woven stuffs, is interesting. An abstract of this has been published by the Committee on Disinfectants of the American Public Health Association. It confirms the statements made by Vallin in his treatise on disinfectants.

The inspection of meats resulted in the condemnation of 85,837 pounds, or nearly 43 tons, as unfit for food in the period of eleven months. The report of the Veterinary Inspector, L. McLean, states that a systematic inspection of the cow-stables in the city has been organized, with the result of greatly diminishing their number and of reducing the percentage of diseased animals from ten per cent. to two per cent. He very properly urges the necessity of a public abattoir.

We do not find in the report any account of the expenditures for the year, which is to be regretted, but we are told that \$9,550.89 was expended in the removal of dirt and filth from streets, yards, etc., from May 15 to October 1, 1885. We commend the book to all health officers and sanitarians.

Gas and Electricity.

Illuminating Power of Gas in New York City.

Week ending	New York Gas-Light Company.	Manhattan Gas-Light Company.	Metropolitan Gas-Light Company.	Mutual Gas-Light Company.	Municipal Gas-Light Company.	Kickerbocker Gas-Light Company.	Equitable Gas-Light Company.
September 4	24.48	20.68	22.04	31.22	27.84	21.43	31.93

E. G. LOVE, Ph.D., *Gas Examiner.*

THE bids submitted to the Gas Committee of Toledo, O., last week for lighting the streets have all been rejected, and the committee has decided to ask for two sets of new ones—one for a five-year, the other for a two-year contract.

A SYNDICATE of Milwaukee gentlemen had bought large tracts of land in Grand Chute, Greenville, Freedom, and other townships in Calumet County, near Dundas, Wis., to sink wells for natural-gas. The syndicate is interested in iron mines, and it is proposed to establish smelting-furnaces near the gas-wells, if such are struck.

A NEW form of primary battery, intended for installations of electric-lighting, such as would be requisite for domestic purposes, has lately been put upon the market by Woodhouse & Rawson, of Queen Victoria Street, London, the inventor being Mr. Upward. The battery consists of twenty cells, each composed of an outer and inner vessel, containing respectively carbon and zinc plates, both chambers being hermetically sealed. Chlorine gas is passed through the battery, and the electricity generated is conducted thence through a series of storage-cells, whence it is connected with the lamp-wires. The installation is of such a character that it can be erected in an ordinary house cupboard, the amount of attention stated as requisite being a half-yearly renewal of the zinc plates.

OUR Philadelphia correspondent writes: "With the opening of the new City Councils comes another effort of private parties to secure the lease of the gas-works of the city. The new syndicate proposes to lease the gas-works for the period of twenty-five years for the sum of \$25,000,000, to be paid in yearly installments of one million dollars, and they will give a bond of \$3,000,000 as security. They agree to furnish gas of at least ten per cent. greater illuminating power than that now furnished, and also to charge not more than \$1.50 per 1,000 feet to private individuals, and to charge the city at the rate of seventy-five cents per 1,000 cubic feet for all gas used by the corporation. It is more than likely the present effort will be of no avail, and that, like the former attempts to secure the control of the gas-works by private parties, it will be impossible to pass such ordinance by City Councils, as the feeling seems largely to prevail that the city should hold the works and operate them as the city's property."

THE MILWAUKEE RIVER NUISANCE.

THE Grand Jury has been working hard this week on the open-sewer question, and will probably bring in a few indictments against the proprietors of establishments that are dumping filth into the Milwaukee rivers.

THE *Detroit Free Press* says: "It was a great mistake to set up the obelisk in New York. For lack of the torrid atmosphere charged with all sorts of vile odors by which it was surrounded for so many years it is rapidly crumbling to pieces, notwithstanding the paraffine overcoat with which it was supplied. It ought to have been set up in Chicago."

Patents.

No. 347,580, for a wrench, is granted to James B. Dean, of Stockholm, N. J. The movable jaw is on a toothed arm, which enters a box pivoted to one arm of the wrench. This toothed arm can be adjusted in the box by a locking device, thus governing the amount of opening of the jaws.

No. 347,585, granted to John H. Engelhardt for a water-closet seat protector, is a sheet having a flap in the opening over the water-closet bowl. The sheet is held in a place by a flange which projects into the bowl.

No. 347,594, for lead pipe, granted to Edwin Haas, of Philadelphia, is a lead pipe having corrugations extending spirally around it, both inside and outside.

No. 347,598, to Bernard Havanagh, of New York, for a water-closet of the wash-out type, shows a closet bowl in which the water-supply enters a receiving chamber placed a little above the level of the main bowl. The capacity of this chamber is sufficient to fill the concavity of the bowl up to the level of the outlet opening after the supply is shut off, and water is allowed to drip from the receiving-chamber into the bowl, in order to so fill it.

No. 347,603 is for a gas-engine, with oscillating cylinder, and is granted to James Hodgkinson and John H. Dewhurst, of Manchester, Eng.

No. 347,615, for a smoke consumer to be attached to steam-boilers, is granted to John Keane, of San Francisco.

No. 347,622, for a regenerative gas-lamp, is granted to Charles M. Lungren, of New York. It is the combination of an annular burner having an air-passage through it, which passage communicates with the external air at its lower end, an air-heating chamber located above the burner-tip and having an outlet for air at its lower end and an inlet for air at its upper end, an air-passage or channel leading across the escape-flue and communicating with the upper end of the air-heating chamber, an inclosing globe, an escape flue, the inlet end of which surrounds the upper end of the air-heating chamber, and an air-passage between the wall of the escape flue and globe, substantially as specified.

No. 347,631, to Truman Merriam, for a pipe covering, is composed of an outer metallic casing, lining, a non-conductor of heat filling inclosed and held by said casing and lining in connected segmental sections, and wires securing the outer edges and ends of said lining to said casing, and retaining the filling in place, substantially as and for the purpose set forth.

No. 347,656 is for a gas-engine, granted to Reuben F. Smith, Pleasant Hall, Ala.

No. 347,684, for combined valve and overflow pipe for bath-tubs, wash-basins, sinks, etc., is granted to William Bunting, Jr., of Boston, who assigns to the Meyer-Sniffen Company (Limited), of New York. The standing overflow in the waste opening is made to form a valve, so that by rotating the overflow the waste-opening is closed and opened.

No. 347,727, granted to Thomas F. Morrin, of Jersey City, N. J. The valve-stem of an angle-valve has two valves upon it, so arranged that the seating of one keeps the other off its seat. The stem is rectangular, filling loosely in the socket of the main valve. This main valve has a screw-thread engaging a thread of the valve-casing, so that revolving the stem causing the main valve to move toward or away from its seat.

Association News.

AMERICAN PUBLIC HEALTH ASSOCIATION.—The fourteenth annual convention will be held at Toronto, beginning on October 5 and continuing four days. The headquarters of the officers and committees will be at the Rossin House and the meetings will be held in Shaftesbury Hall. The Executive Committee has announced the following subjects for consideration: The disposal of the refuse matters of cities and towns; the condition of stored water-supplies, and their relation to the public health; the best methods and the apparatus necessary for the teaching of hygiene in the public schools, as well as the means for securing uniformity in such instruction; recent sanitary ex-

periences in connection with the exclusion and suppression of epidemic disease. In addition will be the Lomb Prize Essays on the Sanitary Condition and Necessities of School-Houses and School Life; prize, \$500. Committee of Award: Dr. E. M. Moore, of Rochester, N. Y., President of the New York State Board of Health, Medical Director Albert L. Gihon, U. S. N., Major Charles Smart, Surgeon, U. S. A., Prof. C. A. Lindsley, of New Haven, Secretary of the Connecticut State Board of Health, and Dr. J. T. Reeve, of Appleton, Wis., Secretary of the Wisconsin State Board of Health; also, on the Preventable Causes of Disease, Injury, and Death in American Manufactories and Workshops and the Best Means and Appliances for Preventing and Avoiding Them; prize, \$500. Committee of Award: Dr. Granville P. Conn, of Concord, N. H., President of the New Hampshire State Board of Health, Mr. John Fallon, of Lawrence, Mass., Dr. Stephen Smith, of New York, Mr. Crosby Gray, of Pittsburgh, Pa., and Dr. C. W. Chancellor, of Baltimore, Secretary of the Maryland State Board of Health. Mr. Lomb has also offered prizes for plans for dwelling-houses, the first plan to show a dwelling-house costing not more than \$800, exclusive of cellar, prizes \$200, \$100, \$50, and \$25; the second plan for a dwelling-house not to exceed in cost \$1,600, exclusive of the cellar, prizes \$200, \$100, \$50, and \$25; also, for a dwelling-house not to cost more than \$1,600, including the cellar, prizes \$200, \$100, \$50, \$25. The Committee of Award will be Major J. S. Billings, U. S. A., of Washington, D. C., Col. George E. Waring, Jr., of Newport, R. I., Dr. E. M. Hunt, of Trenton, Secretary of the New Jersey State Board of Health, Dr. J. H. Raymond, of Brooklyn, and Prof. Charles N. Hewitt, of Red Wing, Minn., Secretary of the Minnesota State Board of Health.

During the convention sessions will be held in the Section of State Boards of Health which was provided for at the meeting last year. The section will have a preliminary meeting to organize at Toronto, October 4. Members who desire to attend should notify Dr. P. H. Bryce, of Toronto, as soon as possible, that he may make arrangements for reduced fares. All papers and reports should be sent to the Secretary, Dr. Irving A. Watson, at Concord, N. H., at the earliest moment.

STATIONARY ENGINEERS.—The annual convention of the National Association of Stationary Engineers was held last Tuesday.

THE Steam-Fitters' Union of Boston had the annual picnic last Friday, going to Walden Lake.

PERSONAL.

MR. JOHN TIERNEY, of the firm of P. & J. Tierney, Providence, R. I., died on September 6 after a short illness, aged thirty-eight years.

MR. WALTER MACFARLAND and Mr. James S. Rogers, Jr., have formed an architectural copartnership and have opened an office in the Moffat Block, Detroit, Mich.

Notes.

For works for which proposals are requested, see also the "Proposal Column," pages 341 and 342.

CONSTRUCTION.

MILWAUKEE, WIS.—Proposals for building a new section of the intercepting sewer on the West Side will soon be advertised for by the Department of Public Works. It extends from Fifth Avenue to Muskego Avenue. Plans have been prepared by the City Engineer.

TORONTO, ONT., is advertising again for bids from engineers of standing to take the position of Commissioner of Public Works and Health. The matter is kept open until September 16, and D. M. Defoe, Chairman of the Executive Committee, City Hall, is the one to address.

WATERTOWN, MINN.—On August 30, at town election, the proposition to put in water-works was voted down by a large majority.

CLARINDA, IOWA.—By a misprint we were made to say last week that proposals for water-works would be opened for Cleveland, O., on September 9. The town should have been Clarinda, Iowa. W. L. Lundy is the City Clerk.

NEWARK, N. J.—Plans have been prepared for the pumping-station of the intercepting sewer, and bids will be asked for. The matter is in charge of the Council Committee. The engineer of the work is Mr. John S. Schaeffer.

TUNNEL UNDER CUMBERLAND STRAIT.—Mr. Walter Stanly, consulting engineer on the tunnel between Prince Edward's Island and the mainland, states that a company has obtained a charter, and has asked Parliament to provide a vessel for making surveys.

HERKIMER, N. Y.—At a town election, last week, there was a good majority in favor of having water-works. It is now to be decided how they shall be built—by the village, or by a private company to whom a franchise may be given.

LARGE PUBLIC BUILDINGS.—Bids should be addressed, until September 11, to the Building Committee of the Hudson River State Hospital for constructing four blocks of buildings, after plans by Frederick C. Withers, architect, of New York City. The committee are: Jacob B. Carpenter, Chairman, Charles H. Stott, Jr., John I. Platt, James Roosevelt.

MONTREAL, CAN.—The Inundation Committee decided, on September 2, to report favorably to council on the proposition of the St. Gabriel Levee and Railway Company, through Sir A. T. Galt, to build levees, etc., to prevent the flooding of the lower districts of the city, in consideration of the payment by the city of \$100,000. The *Star* inclines to the opinion that council will reject the proposition, as the work cannot be finished in time to prevent the flooding of the city next spring.

SYRACUSE, N. Y.—Homer A. L. Sweet is locating the new reservoir for the water-supply on Salmon River. The reservoir is distant from the city thirty-five to forty miles. It is stated that 30-inch iron mains will convey the water. The cost of the works complete is estimated at \$1,500,000.

STEAM-FITTING proposals among others, for steam-fitting in a school building, will be received until September 15 by the Board of Education, of Union, N. J.

KANSAS CITY.—On September 14 a special election will be held on the question of issuing \$500,000 of bonds to build a new court-house.

WATER-WORKS.—The Altoona, Pa., Committee of Councils on Water-Supply has decided in favor of the plan of water-works enlargement reported by Engineer C. W. Knight, and has carried the following resolutions: "(1) We recommend the following to be done by the City Councils—viz.: Finish Kittanning Point reservoir and build suitable spill-way, repair the basin on Prospect Hill, and perfect the distributing system in accordance with Engineer Knight's plan; (2) We also recommend that a 16-inch supply-pipe be laid to the city; (3) We recommend that an impounding-dam be built on Mill Run and that the 16-inch pipe be laid therefrom." The secretary of the committee is T. W. Cole. The cost is estimated all the way from \$114,000 to \$200,000.

PULLMAN, ILL.—Mr. J. E. Townsend, Marine Architect of Chicago, has prepared plans for a passenger steamer for George M. Pullman, to cost \$25,000. Campbell Bros. will be the builders.

MINNEAPOLIS, MINN.—Pumping-engines may be wanted. At a recent meeting of the Water Board, Mr. James Waters, Engineer, submitted drawings for the projected North-West Side pumping-station and engine. He estimated the total cost, including land and a 10,000,000-gallon pumping-engine, at \$108,921. The Superintendent is Mr. J. W. Henion.

The engineer will advertise for proposals for five boilers of 100 horse-power each, and two engines of 200 horse-power each.

WASHINGTON, D. C.—Chief Clerk Youmans, of the Treasury, has decided upon a plan for improving the ventilation of that building. Congress appropriated \$20,000 as the first installment of a fund for renovating the building. With this money, the plan is to remove all the water-closets and substitute those of the latest design. Mr. Youmans conferred with Mr. Robinson, Inspector of the District plumbing, and after mature deliberation it was decided that the most pressing demand is for a change of the closets. The work will not be done by contract, but by day labor, as it must progress very slowly, so as not to interfere with the business of the department. It was concluded that a contract would involve a general tearing-up, which would work great inconvenience.

To prevent this only a small force of workmen is employed. The plan is to take one closet at a time and complete it before beginning on another. New closets will be put in, so as to make connection with outside sewerage. After completing this part of the work the sewerage will be taken up and changed. The District Commissioners have given permission for Mr. Robinson to supervise the work, on condition that it shall not interfere with his regular duties.—*Washington Star*.

BOSTON, MASS.—Proposals were received September 3 for building and erecting a wrought-iron tank on Mount Bellevue, Jamaica Plain, for the use of the Water Department. The bids were as follows: Tippet & Wood, Phillipsburg, N. J., \$3,700; George Miles, Boston, \$3,195.65; James Russell & Co., Boston, \$2,990; Atlantic Works, East Boston, \$2,987; H. S. Robinson, \$2,870; Cunningham Iron-Works, \$3,450; Scannell & Wholley, Lowell, \$3,195; E. Hodge & Co., East Boston, \$2,700; Kendall & Roberts, Cambridgeport, \$3,410; Whittier Machine Company, Boston, \$2,808. The contract was awarded to E. Hodge & Co.

ROCHESTER, N. Y.—The Executive Board has awarded a contract for Medina stone and labor on Lowell Street improvement to McConnell & Jones at \$15,432.60.

LAKE, ILL.—Bids for furnishing two horizontal compound-condensing pumping-engines, with equipments complete, were opened by the Board of Trustees, September 2, as below: H. R. Worthington, according to specifications, for \$118,000; Holly Company, \$93,000; Gordon, Maxwell & Co., \$73,500 and \$76,500.

COLUMBUS, O., intends to make extensive street improvements, and the City Engineer has prepared estimates of cost as follows: Stone block pavement and curb on Front Street, \$44,863.85 to \$64,257.20, according to stone used.

SOUTH LYON, MICH.—A company has been formed for the introduction of water-works.

BROOKLYN, N. Y.—The suit of Contractor Patrick Carlin to compel the Kings County Board of Supervisors to accept the bid of \$50,000 for certain articles to be furnished to the County Farm at St. Johnland, was argued recently before Justice Cullen, in the Supreme Court, in Brooklyn. Carlin's bid was the only one presented, and the board refused to award the contract because there had been no competition. The court upheld the board in that opinion and denied Mr. Carlin's motion.

GOVERNMENT WORK.

LIST of proposals received by General M. C. Meigs, Supervising Engineer and Architect of new Pension Building, for furnishing seventy-eight window-guards for first story of Pension Office Building, as per circular letter of August 20: Howard & Morse, New York, \$791.76; Composite Iron-Works Co., New York, \$6.40 each, \$499.20; Manly & Cooper Mfg Co., Philadelphia, \$970; Duper & Co., Baltimore, \$7.35 each, \$573.30; Perot & Walker, Philadelphia, \$620; Fred. J. Myers Mfg Co., Covington, Ky., \$604.50; Cheney & Hewlett, New York, \$665; David Pettit & Co., Philadelphia, \$650; Jackson Architectural Iron-Works, New York, \$10.50 each, \$819; National Wire & Iron Co., Detroit, Mich., galvanized frames, \$700; painted frames, \$640. Contract awarded to Composite Iron-Works Company at their bid.

GREENSBORO, N. C.—Synopsis of bids for stone-work, grading, curbing, and sodding, etc., for approaches to Court-House, etc., opened August 3: Belknap & Dumesnil Stone Co., \$4,400; John Moore, \$3,898; A. McCarthy & Corbett, Indiana limestone, \$5,407; native limestone, \$5,100.

Synopsis of bids for artificial stone sidewalks, etc.: Belknap & Dumesnil Stone Co., \$1,200; Bowling Green stone; John Moore, \$700; H. J. McLaughlin, \$1,062.24; McCarthy & Corbett, \$700.

TOLEDO, O.—Synopsis of bids for joiner's work, wood flooring, post-office screen, glass, hardware, painting, and polishing, for Custom House, etc., opened August 30, 1886: John O'Connor, oak, \$37,000; cherry, \$39,000; mahogany, \$41,000; 8c. per square foot for additional flooring. John Moore, oak, \$28,107; mahogany, \$29,907; cherry, \$28,467. Cudell & Lehmann, oak, \$31,641; cherry, \$33,277; mahogany, \$35,040; 12c. per square foot for additional flooring.

WASHINGTON, D. C.—Synopsis of bids for furnishing and delivering polished plate, double thick, and hammered glass for west and centre wings of building for State, War, and Navy Departments, opened August 27:

Remarks.	No sample.	Sample.	"	"	"
For the whole, including duty.	\$7,307.25	.....	8,445.00	8,066.27	5,596.57
For the whole, exclusive of duty.	.....	\$5,415.00	5,510.00	4,990.83	2,506.00
For the hammered.	\$344.45	470.00	483.00	481.81	499.45
For the double thick.	\$64.45	177.00	192.00	224.95	300.00
For polished plate, including duty.	\$6,798.35	.....	7,770.00	7,359.51	4,897.12
For polished plate, exclusive of duty.	.....	\$4,762.00	4,844.00	4,284.07	1,807.15
BIDDERS.	W. C. De Paw, New Albany, N. Y.	Simon Bache & Co., New York	J. A. Walber, New York	B. H. Shoemaker, Philadelphia, Pa.	Hulbrook Bros., New York

The bid of Holbrook Bros. was received August 28 in registered letter bearing New York Post-Office stamp of August 26, 1886.

JEFFERSON CITY, MO.—Synopsis of bids for iron furring and lathing for Court-House, etc., opened August 31, 1886: John Cooper, \$700; 18c. per square foot for additional work. Haugh, Ketcham & Co., \$732.80; 16c. per square foot for additional work.

HARRISONBURG, VA.—Synopsis of bids for iron and slate work of stairways for Court-House, Post-Office, etc., opened August 31, 1886: Woodhill & O'Gorman, \$2,713, five months; Sneed & Co. Iron-Works, \$1,702, eight weeks; Van Doren Iron-Works, \$2,100; Manley & Cooper Mfg. Co., \$2,197, three months.

Building Intelligence.

We solicit from each and every one of our readers information relating to projected buildings in their locality, and should be glad to receive newspaper clippings and other items of interest.

ABBREVIATIONS.—b s, brown stone; br, brick; br st, brick store; b s dwell, brown-stone dwelling; apart house, apartment-house; ten, tenement; e, each; s, owner; a, architect; b, builder; fr, frame.

NEW YORK CITY.

89 Ridge st, rear, 4-story br tailor's workshop; cost, \$6,000; o, Peyser Beek, 89 Ridge st; a, Chas. Rentz.

126-28 Cannon st, 2 5-story and bmt br tens with stores; cost, each, \$15,000; o, Jacob Buess, 57 Clinton st, and Joseph Hauser, 625 6th st; a, Jordan & Giller; m, Joseph Hauser.

176 Clinton st, 5-story and bmt br ten with stores; cost, \$20,000; o, Morris Rosendorf; a, Blankenstein & Herter.

239 E 10th st, 5-story and bmt br ten; cost, \$20,000; o, Morris Rosendorf; a, Blankenstein & Herter.

Av C, s w cor 14th st, 6-story br flat with stores; cost, \$100,000; o, R. F. & W. B. Cutting; a, Chas. C. Haight.

Piers 2 and 3, East River, 2-story frame and iron ferry house; cost, \$30,000; o, Goellet estate; lessees, N. Y. and South Brooklyn Ferry and Steam Transportation Co.

302-04 E 38th st, 2 5-story br tens; cost, each, \$12,000; o, Christian Stoehr, 710 2d av; a, Berger & Baylies.

BUILDING INTELLIGENCE.

38th st, s s, 130 e 2d av, 5-story br ten; cost, \$9,000; o and a, same as last.

765 10th av, 5-story br ten; cost, \$15,500; o, Marks Silverberg, 408 East 52d st; a, Emile Gruwe.

18th st, s s, 345 e Av A, 3-story br dwell; cost, \$10,000; o, Sisters of the Order of St. Dominick, 137 2d st; a, William Schickel & Co.

6 W 56th st, 5-story br dwell; cost, \$30,000; o, Mary L. Schenk; a, Rotch & Tilden; b, J. B. Smith and Morton & Chesley.

70th st, n s, 275 e 2d av, 2 5-story br flats; cost, each, \$18,000; o, Wm. C. Burne, 121 E 114th st; a, J. C. Burne; b, not selected.

Av B, n w cor 85th st, 4-story br (st front) flat with store; cost, \$19,000; o, John Graham, Sea Cliff, N. Y.; a, F. T. Camp.

Av B, w s, 21.2 n 85th st, 3 4-story br (stone front) tens; cost, each, \$14,500; o and a, same as last.

64th st, n s, 225 w 9th av, 4 4-story br (stone front) dwells; cost, each, \$14,000; o, Chas. H. Bliss, "The Rutland," 57th st and Broadway; a, E. L. Angell.

69th st, n w cor 9th av, 5-story br flat with store; cost, \$30,000; o, Michael Giblin, 453 W 76th st; a, Thom & Wilson; b, day's work.

69th st, n s, 25 w 9th av, 4 4-story br (stone front) dwells; cost, each, \$19,000; o and a, same as last.

10th av, n e cor 67th st, 5-story br ten; cost, \$12,000; o, Maggie C. Smith, 123 W 67th st; a, George Keister.

7th av, w s, 123d to 124th st, 6 5-story br flats with stores; cost, 2 corner bldgs, \$16,000 each; others, \$24,000 each; o, Lucas Sullivan; a, Richard Berger.

Jackson av, e s, 145 s 165th st, 6 bldgs, and Jackson av, w s, 145 s 165th st, 8 bldgs, in all 14 3-story frame dwells; cost each, \$2,700; o and b, John W. Decker, 841 Forest av; a, Adolph Pfeiffer.

Willis av, w s, 50 n 139th st, 2 4-story br tens with stores; cost, each, \$10,000; o, Elizabeth Geis, 637 E 147th st, and Harriet Kusche, 633 E 139th st; a and b, Wm. Kusche.

BROOKLYN.

Greene av, n s, 200 w Nostrand av, 5 3-story and bmt brown stone dwells; cost, each, \$10,000; o, Alex. L. Baird, Wythe av, cor Hewes st; a, A. Hill; b, W. J. Rider.

North 2d st, n w cor Ewen st, 2 4-story fr (br filled) dwells; cost, total, \$12,000; o a, and c, Sammis & Bedford, 461 Graham av; m, Doyle & Brazill.

Lafayette av, n s, 124.2 w Franklin av, 1 3-story br ten; cost, \$5,000; o, G. W. Hubbard, 1307 Pacific st; a and b, C. King.

562-562A, Lafayette av, s s, 2 2-story and bmt br dwells; cost, each, \$4,000; o, N. B. Cook, 564 Lafayette av; a, M. J. Morrill; b, E. T. Rutan and Smith & Thompson.

13-19 Wall st, 3-story br singing hall; cost, \$40,000; o, Arion Society, 21 and 23 Wall st.

175 Central av, s e cor Elm st, 3-story frame (br filled) store and ten; cost, \$6,500; o, Margaret Breuer, 943 Broadway; a, Th. Engelhardt; b, J. Rueger.

Warren st, n s, 90 e Clinton st, 3-story br school house; cost, \$38,000; o, Trustees of St. Pauls R. C. Church; a, T. F. Houghton; b, J. Rooney.

Hopkinson av, n e cor Herkimer st, 1-story br church; cost, \$7,000; o, Ocean Hill Ref. Church; a, L. B. Valk; b, F. Mapes and J. S. McRea.

McDonough st, n s, 353 e Throop av, 4 2 1/2-story and bmt brown stone dwells; cost, each, \$5,286; o, J. J. Almirall, 408 Grand av; a, T. F. Houghton; b, O. Nolan and M. C. Rush.

LATE NEW YORK BUILDINGS.

71st st, s s, 350 ft w of 9th av, br dwell; cost, \$18,000; o, Wm. Meles; a, D. & J. Jardine.

63d st, n e cor 10th av, 4 br flats; cost, ea, \$15,000; o, S. Haberman; a, H. A. Schillinger.

9 and 11 Stanton st, 2 br flats and stores; cost, ea, \$16,000; o, H. Riffel; a, J. Boekell & Son.

10th av, s e cor 108th st, br flat and store; cost, \$20,000; o, D. Christie; a, A. E. Hudson.

6th av, s e cor 120th st, 7 dwells; total cost, \$120,000; o, A. Buchmann; a, Schwarzman & Buchman.

407 W. 19th st, br flat; cost, \$15,000; o, Elisha Bloomer Est.; a, Halsted P. Fowler.

ALTERATIONS, NEW YORK.

504-508 W. 14th st, br factory; cost, \$20,000; o, Harriet B. White Est.; b, William Buckley.

(Continued on page 356.)

ANNOUNCEMENT.

The publication of the sixth revised edition of the U. S. Pharmacopoeia (1880), containing as it does more strict requirements for the purity and strength of pharmaceutical preparations, has been followed in some States of the Union by the enactment of laws against the adulteration of drugs, which laws make the Pharmacopoeia the official standard.

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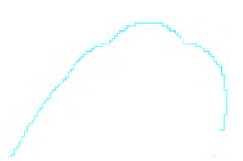
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THE sudden change of mode of life, combined with the effects of fear and mental depression, is liable to produce injury to health in some of the many unfortunate inhabitants of Charleston, who have vacated their houses and are more or less exposed to the vicissitudes of the weather. Fortunately the weather has thus far been such as to cause comparatively little inconvenience; but the rainy season is close at hand, and the sooner the people obtain a satisfactory shelter the better. The Mayor of Charleston fully understands this, and in a very sensible proclamation has advised the people to return to their houses. He says that nearly every frame building in Charleston is safe for habitation, the chimneys may be rebuilt while the house is occupied, and the plastering can be repaired at some future time, and he sets the example by returning to his own brick dwelling. He wisely urges that a return to home life, as far as possible, will restore confidence, rest, and quiet.

The proposition made by Mr. Dodge, at a recent meeting of the New York Chamber of Commerce, to send a sanitary expert to Charleston to advise the people, etc., appears to be entirely unnecessary, and was probably made in ignorance of the fact that Charleston has a very good health organization and an efficient health officer in the person of Dr. Horlbeck. Dr. Horlbeck needs the force and means to maintain a constant supervision of the condition of those who are camping out, especially to insure that the sewage and refuse of so many people are properly disposed of, and that facilities for cleanliness are provided; but we do not believe that he needs any expert advice on this subject.

There is a possible danger in the water-supply of Charleston which it may be well to bear in mind, and that is, that some of the water-pipes may have been displaced or cracked by the earth tremors. At some points these water-pipes pass through sewers, in which case, if broken and empty of water, a risk is incurred that would not exist if they were under pressure, and while there is little probability that there will be any dangerous leakage, its possibility should be recognized and guarded against. There is also some risk from injury to sewers, and from loosening of badly made joints in house-plumbing. A thorough house-to-house inspection from the sanitary point of view is a highly desirable thing for Charleston, and should be carried out within the next three or four months. All these things are, however, no doubt well understood by the sanitary authorities and physicians of Charleston and will be attended to in due time.

WHEN the present municipal authorities of Brooklyn came into power they immediately proceeded to remove most of the capable and honest officials connected with their municipal work. Our readers will remember that they removed Dr. Raymond, the efficient Health Officer, and Mr. Peter Milne, the Water Purveyor. They have left undisturbed Engineer Van Buren, probably because they cannot agree upon his successor, but their last move has been to remove Mr.

John Y. Culyer, who has been the first and only superintendent of their handsome Prospect Park. For seventeen years Mr. Culyer has given this work his best efforts and with entire satisfaction to the people of Brooklyn. He is now replaced by a man who, we understand, does the dirty work of dispensing the patronage of the Brooklyn Navy Yard for the present administration. Moreover, the gardener, who, we understand, is a botanist of some ability and a man well fitted for his position, was removed to furnish a place for a recent importation from England who is a personal friend of one of the commissioners. We do not know that it is any use saying anything further than to record the fact, as the parties now in power will probably take rope enough to hang themselves.

THERE has been some attempt to create a howl about the allowance of five thousand dollars for sinking an extra shaft on the New Croton Aqueduct. We think the commission as it is now constituted may be safely left to decide as to the propriety of that matter. The people do not want to be robbed or have favoritism shown a contractor, neither do they want a contractor persecuted and a just claim resisted, simply because a newspaper reporter might make a sensational item out of the fact.

PROGRESS in the improvement of health, the diminution of sickness, and the lengthening of life depends in part on the increase of human knowledge of the laws of physics, chemistry, and biology, and in part on the diffusion among the people of the practical deductions from this knowledge. Sanitary legislation and improvements for any given community must be regulated very largely by the opinion of the majority of the taxpayers and voters in that community as to the necessity for them, and hence to obtain action for securing a purer water-supply or a better system of sewage disposal, it is not sufficient that a few skilled engineers and physicians are satisfied that improvement is needed, and that this improvement can be best and most economically made in a certain way, but the people must also be convinced of this—must, as the common phrase is, “be educated up to it.”

Among the various means for such education and diffusion of knowledge the most powerful in its influence on the mass of the people in this country is the daily or weekly newspaper. Its omniscience, of course, covers hygiene as well as law, medicine, theology, and all branches of political and social science, and its opinions often turn the scale in doubtful cases. And, in the main, the press of this country recognizes the responsibility which this power entails, and seeks to obtain the best knowledge and the most reliable advice for its columns or as a basis for editorial opinions. In most cases it is to the direct interest of the paper to do this, but in some cases it is not, and it would be easy to name many instances in which an editor has taken the unpopular side of a discussion upon proposed sanitary improvements.

The chief defect of newspaper sanitary literature, taken as a whole, is its tendency to exaggeration and sensationalism, and its liability to be dictated or inspired by a desire for an advertisement. The man who is interested in a patent filter is ready to furnish a column or two on the impurities of the water-supply, with, it may be, a few choice engravings representing strange forms which he tells the shuddering public are entomostraca, desmids, etc. He is careful not to explain that these organisms live in pure water—in fact, that they cannot live in water that is very impure. The man with a patent trap wants to arouse the people to a sense of the dangers of sewer-gas; the dairyman wants to explain the poisonous properties of oleomargarine; the man who failed to get the appointment of health inspector wants to show up the negligence of the health department, and each and all of them do the best they can to get some newspaper to publish their philanthropic essays.

OUR BRITISH CORRESPONDENCE.

Experiments on Lighting Cars with Electricity—An Electric Launch—Completing Westminster Hall—Wood-Pulp for Building Ornaments—Artesian Well at East Horsley Towers, Surrey—Change of Water-Meters in Vienna.

LONDON, August 28, 1886.

FURTHER experiments in the direction of lighting trains by electricity are reported from Glasgow, where an experimental train fitted with the electric-light has been run on the underground railway. The cost is about one-third as compared with gas. Each compartment of a carriage is provided with two incandescent-lamps, each of sixteen candle-power. The contact is so arranged that only one lamp is lighted at a time, and, in the event of a breakage of the lamp in use, the other one is immediately lit up. The London and Brighton Railway several months since ran an experimental train with the same object. Although the experiment was successful and the results to the travelers

It appears that the west face of Westminster Hall is at last to be completed. It will be remembered that the old Law Courts occupied the site, and, for the two years since they have been demolished, the public has been treated to an unsightly boarding. The contract is allotted to Shillitoe & Son, of Bury St. Edmunds, on the designs of Mr. Pearson. There is an extraordinary report that, in connection with the building, a couple of staircases would be taken through a portion of Westminster Hall. This report is so extraordinary, and the damage done to Westminster Hall from an architectural point of view would be so irretrievable, that it is difficult to believe that there is any truth in it, although it is brought forward on good authority.

A new use for wood-pulp is reported from Norway, and will be of considerable interest in America. This consists in its utilization for such articles of building ornamentation as have hitherto been made in plaster of Paris. The discovery was made in the Sognedal Pulp Factory. After being ground, the pulp is pressed into the required forms.



A COTTAGE AT MORRISTOWN, N. J.—GEORGE E. HARNEY, ARCHITECT.

To those who know how much of this sort of matter is floating round in manuscript form in our large cities the wonder is, not that our newspapers should publish so much rubbish in the way of sanitary letters, etc., but that they should publish so little as they do, and when alarming stories alleging a dangerous condition of the Croton water appear in our daily papers it is safe to assume that the editor has been deceived, or the business department have inserted the matter as "a reading notice" at so much a line.

THE City Surveyor of Savannah, Geo., has been instructed to make a careful inspection of all houses in any way damaged by the earthquake, to condemn those that may be in a dangerous condition. The architects of the city are represented as saying that very few houses were seriously damaged. Meantime, many of the citizens have been living in tents, and it is said the exposure has produced fatal illness in a number of cases.

ADVICES have been received in San Francisco of the violent prevalence of cholera in Corea. The number of deaths from July 15 was reported at many thousands.

very satisfactory, the matter does not seem to come any further, owing, perhaps, to the fact that the London and Brighton Railway authorities are so oblivious to the comfort of their passengers that they still give them the old oil-lamps of five candle-power per compartment.

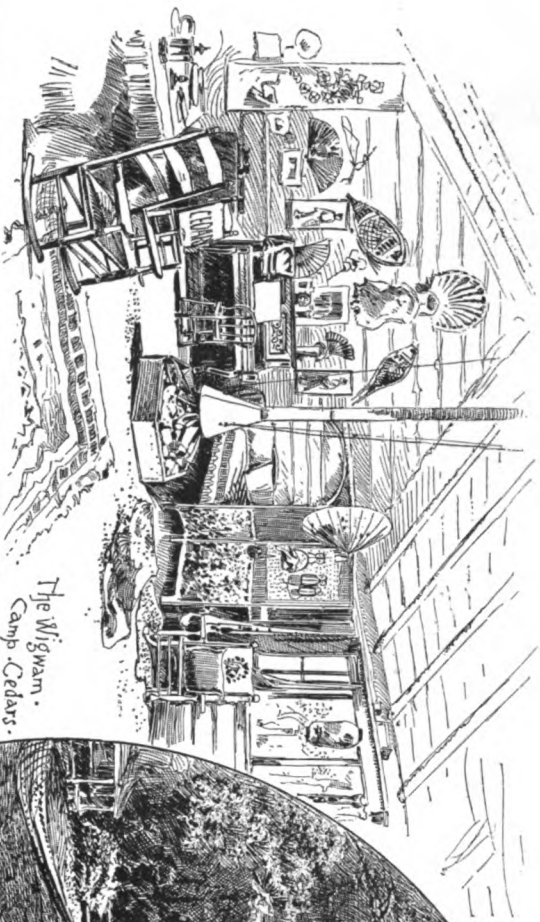
Experiments are also made in another direction by the trial of electricity as a motive power. A fortnight since a trial was made on the Thames with an electric launch built by Smith & Stephens, of Millwall. The run was about three-quarters of an hour, and, on return to the starting place, it is stated that there was sufficient reserve to repeat the trip. A further trial is just reported from Paisley with a screw launch patented by William Gibson, of the Cartha Works in that town. The boat was twenty-four feet by five feet three inches, the engine of two horse-power. The speed was about seven miles per hour. The accumulators in this launch are stored under the side seats of the boat, the current being sent through an armature, on the spindle of which is placed square-cut gearing which reduces the velocity from 1,500 revolutions per minute to 230.

Ceilings, friezes, etc., have been produced which are quite equal in finish to those turned out in plaster of Paris. The articles, in addition, possess great tensile strength, are very light, and not susceptible to the effects of damp.

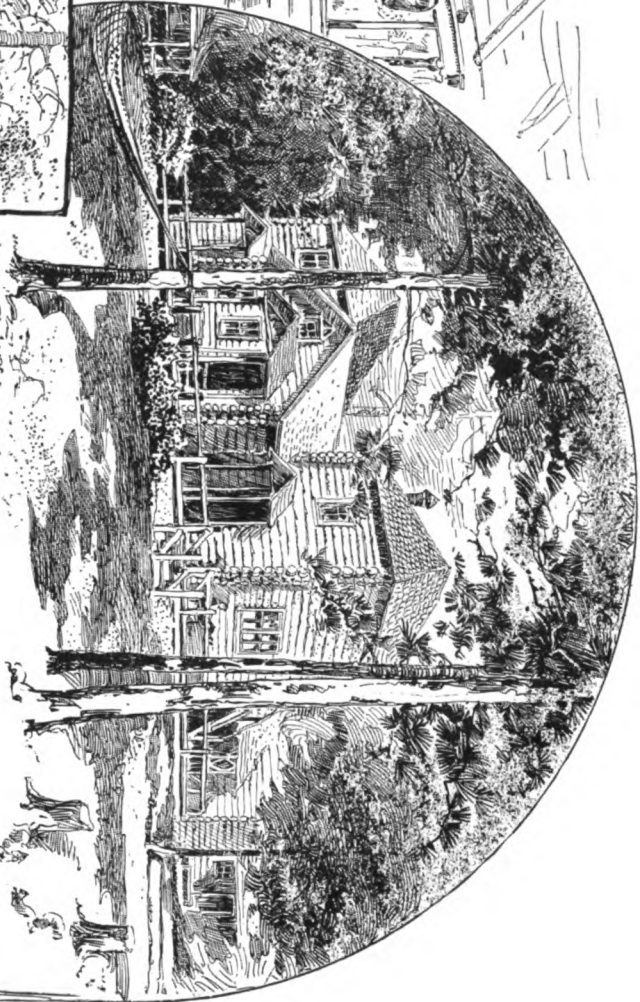
In the course of an artesian well boring at East Horsley Towers, Surrey, Messrs. LeGrand & Sutcliffe, of Bunhill Row, London, have just had to bore through the entire chalk formation. They met the chalk at 33 feet from the surface, and the upper greensand at 825 feet, the thickness of the chalk, therefore, being 792 feet. Little water was found in the upper chalk, a good supply, however, being obtainable at about 500 feet. The total depth of the boring at present reached is 840 feet.

In Vienna the existing water-meters, of which there are about 1,200, have been found to be so inefficient that they have been condemned, and others are to be substituted. It has not, however, yet been decided which form of meter will be adopted.

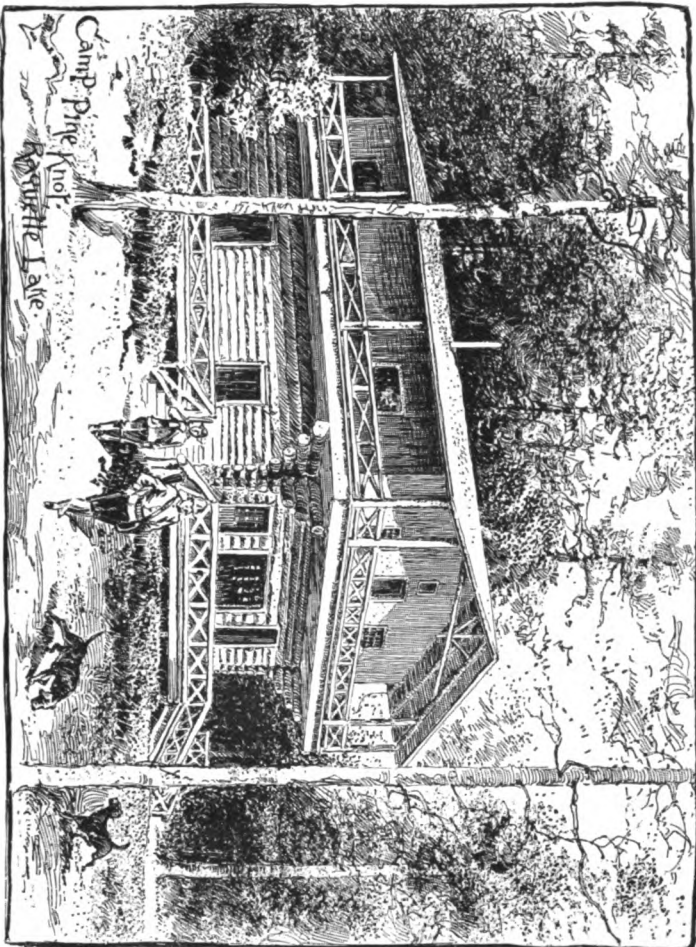
SAFETY-VALVE.



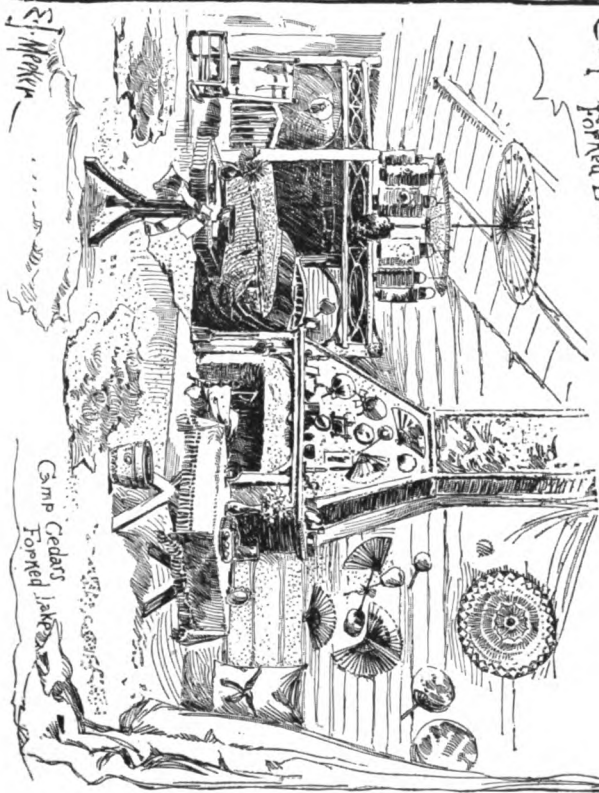
The Wigwam.
Camp Cedars.



Camp Cedars,
Forked Lake.



Camp Pine Knot.
Adirondack Lake.



Camp Cedars,
Forked Lake.

THE SANITARY ENGINEER ILLUSTRATED SERIES.

ARCHITECTURE IN THE ADIRONDACKS.

OUR SPECIAL ILLUSTRATION.

CAMPS IN THE ADIRONDACKS.

THE Adirondack Mountains have had considerable attention drawn to them this summer. Many of the "camps" so called are not as rude as might be imagined. Views of two of them, with their interiors, are the subject of our Special Illustration this week. Unfortunately, we do not know the names of the owners nor of the architects.

OUR ILLUSTRATION OF A MODERATE-COST HOUSE.

A COTTAGE AT MORRISTOWN, N. J.—GEORGE E. HARNEY, ARCHITECT.

THIS cottage was built by the late Governor Randolph, at Morristown, N. J., on a side hill, the house having the kitchen, etc., in the basement, being full height in the rear, and opening directly upon the grounds. The first story is of brick, and second story of frame, shingled. The roof is slated. The first story is ten feet high; second story nine feet high; first story finished in ash; the rest in white pine, painted. Open fire-places are in every room. The cost was about \$6,500.

George E. Harney, of New York, was the architect.

PAVEMENTS AND STREET RAILROADS.

No. I.

LIVERPOOL TRAMWAYS.

WE propose in this and subsequent articles to give quite full details of the important work under this head that has been done in Liverpool. The contrast of methods in the construction of tramways, as compared with those usually pursued in this country, is violent. As will be seen, instead of these important franchises being given away, as they are in our large cities, the city of Liverpool builds the roads and leases them at the handsome figure of about eight per cent. on their entire cost.

The change in the method began in 1880, when the city, under powers granted by Parliament, purchased the then existing lines. Since that date the lines have been extended, until now the total length of single line is 45¾ miles. In connection with the construction of the lines 198,452 square yards of stone block paving within the statutory width has been set on a foundation of Portland cement concrete, and the total cost, including engineering and other incidentals, has been \$1,394,736, or \$30,486 per mile of single track. The whole street has also been paved in tramway streets, requiring in all about three times the amount of paving mentioned, and the monthly progress has been about one mile of tramway and 13,400 yards of "impervious" paving, all executed by corporation workmen under the supervision of the City Engineer, Mr. Clement Dunscombe, M. I. C. E., and staff.

In doing the work all old stone blocks were taken up and redressed, occupying forty-two stone-dressers. The fragments and waste were used in concrete, and in the cost given the value of all old materials is included.

Prior to 1879 the reconstructions and extensions were made on the system of Mr. Deacon. Since that time they have been made on a modification of this known now as the "Lyver" system. The cost of maintenance is spoken of as very small.

Figure 1 is a general view showing the work of laying the road in progress.

Figure 2 shows a longitudinal elevation of the rail.

In constructing the work the street is fully excavated to a depth determined upon as it progresses. A bed of Portland cement concrete is then formed to within 7½ and 6½ inches respectively of the finished roadway. The concrete is made of one part by measure of cement, six parts of gravel, and eight parts of broken stone. The cement is first mixed dry with four times its bulk of gravel and then wet and mixed with the remainder, only water enough being added to make the mass just adhere together when pressed in the hand.

On the bed prepared for the concrete, molded blocks of Portland cement concrete, eight inches square at the base, are laid with their upper faces on a level with the under side of the sleepers B (see Fig. 3, which is cross-section of one rail). The sleepers are then laid on the blocks, the rails A being placed on them, and the wrought-iron jaws C secured to the rails by bronze bolts D and wrought-iron nuts E. A small space is maintained by temporary washers between the upper surfaces of the jaws and the rails. As soon as the rails are leveled up and in proper position the



FIGURE 1.—LAYING THE ROAD.

concreting is proceeded with up to the level of the bottom of the sleepers, as shown. After the concrete is set the bolts are unscrewed, the temporary washers removed, and the rails A and sleepers B firmly screwed down to the jaws. The recesses or handholes are then completely filled with plaster-pitch which keeps the nut E from turning round.

the joints are filled with clean dry shingle passing through a ¾-inch sieve and retained by a ¾-inch sieve. The sets are then rammed and new shingle applied until the joints are full, after which they are grouted with hot pitch and creosote oil of the best quality and covered with half an inch of sharp gravel.

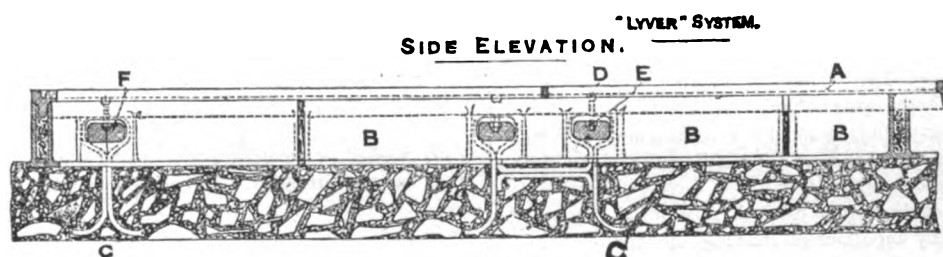


FIGURE 2.

The jaws are placed three feet between centres, except at the ends of rails, where the space is nine inches. Points and crossings are of annealed crucible steel, secured to special cast-iron sleepers, a layer of roofing-felt being laid between them and the sleepers.

Between the rails, and for eighteen inches on either side,

ENLARGED SECTION.

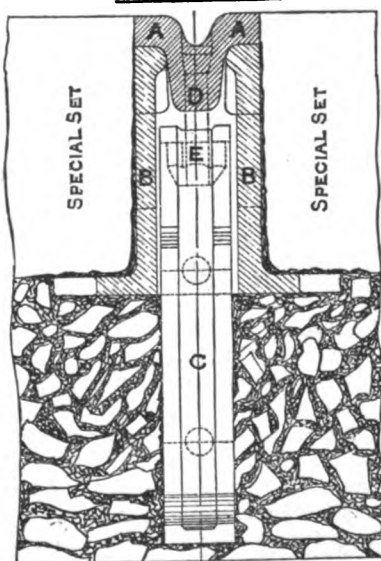


FIG. 3.

the roadway is paved with syenite blocks. The blocks are cut 3¼x5 to 7 inches, and in two depths—viz., 6¼ and 7¼ inches—also 3¼x3¼x6¼ inches deep. They are squared throughout, accurately gauged, with a maximum allowed variation of one-quarter of an inch, and laid in straight and properly bonded courses on an even bed of fine gravel not exceeding half an inch thick. After paving,

Along each side of the rail there is laid a course of alternate long and short blocks, shaped in plan as shown in Fig. 4. These are finely cut on the side next the rail so as to make close contact; they are also cut to touch each other for one and a half inches from the rail.

The weights per mile of single track are given as follows:

Bessemer steel rails, 40 lbs. per lineal yard...	62.8 gross tons.
Cast-iron sleepers, 80 lbs. per lineal yard...	125.6 "
Wrought-iron jaws, single, 4.28 lbs. each...	115.5 cwt.
Wrought-iron jaws, double, 10.5 lbs. each...	35.5 "
Bronze bolts, 4 ozs. each...	9.83 "
Wrought-iron nuts, 5 ozs. each...	10.5 "

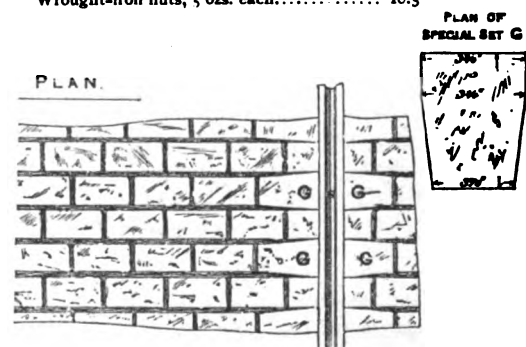


FIG. 4.

The Portland cement was all tested. A 50-gauge wire sieve (2,500 meshes per square inch) must not retain more than 10 per cent.

When tested neat, after twenty-four hours' immersion in water, it must stand 1,000 pounds on 2¼ square inches. Slow-setting cement must take an impression from a needle having an area of ¼ of an inch, and loaded with 2½ pounds, at any time within three hours after molding, and quick-setting cement must give an impression at any time within half an hour.

The Bessemer rails were tested by the drop test. With groove upward, rail supported at three feet between sup-

ports, weight 2,240 pounds, dropped ten feet, the average deflection was 8.51 inches and none were broken. Tensile tests were made on pieces eighteen inches long cut from rails. Allowed limit twenty-eight to thirty-two gross tons per square inch, with elongation of twenty per cent. on $6\frac{1}{4}$ inches. The average strength was 31.62 tons, and elongation $22\frac{1}{2}$ per cent. Hot bending tests by heating to cherry red and cooling in water at 80° , and bending afterward double, to a curve with inner radius of three times the thickness of specimen, gave no fractures. Short lengths were bent cold under steam-hammer to a radius of six inches.

Deflection tests, with supports three feet apart, showed maximum elasticity of ten tons and a minimum of five tons.

Cast-iron was tested on supports three feet apart, bars one inch square to support a centre load of 800 pounds. The maximum was 1,800, minimum 640, and average 960 pounds.

Two per cent. of the bolts were tested by a load of three tons, the nut being turned while the load was on, about four per cent. failing under test from inferior workmanship.

Sample nuts were tested by heating to a cherry red and flattening on an anvil. The result of reducing the thickness from one inch to one-eighth of an inch was to show no splitting at the edges.

(TO BE CONTINUED.)

THE CHANGE OF DIMENSIONS IN MASONRY DURING HARDENING AND COMPRESSIVE TESTS.

THE subject of the evening at the first fall meeting of the American Society of Civil Engineers, on the 1st inst., was the report of the Committee on Compression of Cements and Other Mortars, presented by Mr. F. Collingwood, Chairman. The report gave the result of the committee's labors thus far in a study of existing information on the subject, and a collation and reproduction of that which they considered important, together with some results not hitherto made public.

The first experiments noted were a series made at Watertown for the "Commission for the Erection of the Philadelphia Public Buildings."

The first of these were on 6-inch cubes of building-stone, and are chiefly important as showing the increased coefficient of strength obtained when large specimens are employed; also that some stones give higher results when placed on end than when on their beds.

Bricks tested in full size on their beds gave results as follows: Hard-burned Philadelphia showed first sign of failure at 3,000 pounds, the average crushing strength of six being 8,197 pounds, with maximum of 11,720 and minimum of 5,540 pounds. Philadelphia machine-made pressed brick began failing at 2,500 pounds, with average crushing strength of three of 8,010 pounds, with maximum and minimum of 9,050 and 7,210 pounds. Hand-made Philadelphia brick began failing at 3,000 to 6,300 pounds, with average, etc., for five of 14,658, 20,830, and 10,970 pounds.

A solid cylinder of cast-iron of three inches diameter and six inches long crushed at 60,360 pounds per square inch. The same quantity of metal in a hollow cylinder $4\frac{1}{2}$ inches in external diameter and same length failed at 68,190 pounds, and the same $8\frac{3}{4}$ inches diameter at 79,230 pounds, the limit of elasticity being about 15,000 pounds.

The limit of elasticity of rolled wrought-iron I-beams under compression in 6-inch lengths was about 30,000 pounds, and failure took place by buckling at 54,000 pounds.

The remaining tests were on cubes of brick-work, some laid up in cement and some in lime mortar, the dimensions being five bricks high and $1\frac{1}{2}$ bricks square. The cement mortar was of one part Rosendale (Valley brand) to two of sharp sand, and the lime mortar one of Cedar Hollow (Chester County, Pa.) lime to four of sand, and all specimens were fifteen months old.

Of six specimens of the latter the first "snapping sounds" were heard at 499 pounds to 1,070 pounds pressure per square inch. The first perceptible crack occurred at an average of 848 pounds, and the average crushing strength was 1,360 pounds.

The first perceptible permanent set was noticed at 302 to 320 pounds per square inch, with an average compression of 0.0216-inch on $12\frac{3}{4}$ inches, the coefficient of compression thus obtained being 0.00054 per 100 lbs. of applied load;

that is to say, the total load per square inch divided by 100, multiplied by the length and by the coefficient given, will give the total compression of similar specimens of any length. This coefficient was quite uniform up to the time when snapping sounds were heard, it being at that time slightly less, but increasing rapidly afterward.

Similarly the six specimens in cement mortar gave first set at 296 to 320 pounds, with an average of 311, first snapping sounds at 627 to 1,845, with 1,300 pounds average, and first perceptible crack at 960 to 2,070, with an average of 1,466 pounds per square inch. The coefficient of compression at first set was 0.00045, and at the time of first snapping sounds 0.0003. To make this series complete the compression of the bricks should be known, but this the tables do not give.

The next table given is one from Professor Bauschinger, of Munich, translated from the German. This gives the results of some very careful experiments on cubes of $4\frac{1}{8}$ inches. Five specimens from each of seven different branches of cement and also of three different mixtures, each of German and French, were made. Of each five three were allowed to set in the air and two in the water, and the tests were made in a special measuring-apparatus, which is illustrated. Corrections were also made for temperature. The results are thus summed up:

First—In the case of all three proportions of cement and sand, the specimens hardening in air show a progressive contraction with age, sometimes with a slight preliminary expansion up to an age of one week.

Second—The total effect at the end of sixteen weeks where mortars harden in air is in every case a contraction.

Third—The total contraction is in general greatest with neat cement, decreasing as the proportion of sand is increased. In some cases, however, the addition of sand seems to accelerate the contraction during the first four weeks, making it greater as the proportion of sand is greater.

Fourth—The total contraction after sixteen weeks for mortars hardening in air varies as follows:

	Per cent.
1 of cement to 0 of sand the contraction is from...	0.12 to 0.34
1 " " 3 " " " " " "	0.08 to 0.15
1 " " 5 " " " " " "	0.08 to 0.14

Fifth—With cement hardening under water, the results are much more irregular, there being generally an expansion, but in a few cases no practical change in sixteen weeks.

Sixth—The expansion under water is greatest and most regular with neat cement, and increases progressively with age. It becomes less and more irregular as the proportion of sand is increased.

Seventh—The total expansion of cement hardening under water varies as follows:

	Per cent.
1 of cement to 0 of sand the expansion is.....	0.01 to 0.15
1 " " 3 " " " " " "	0.0 to 0.02
1 " " 5 " " " " " "	0.03 to 0.02

The last table gives an earlier set of tests on prisms of English Portland cement, four inches long and two inches square, hardening under water (reprinted from Transactions of the Institution of Civil Engineers).

The summary of conclusions given is as follows:

First—All cements expand more or less when hardening under water.

Second—This expansion for good cement is so slight that it need hardly be taken into consideration.

Third—It is greatest when the increase in strength is most active.

Fourth—It diminishes in proportion to the admixture of sand.

Fifth—It is greatest with new cement, and least with that which has been kept in stock.

Sixth—It is increased by the admixture of gypsum.

Seventh—It is greatest with overlimed or highly-burned cements. All cements contract when drying, and expand on being placed in water.

The expansion shown by this table was progressive for a year, amounting for neat cement to 0.09 to 0.21 per cent., and for 1 of cement to 3 of sand to 0.01 to 0.06 per cent. With gypsum the figures went up to $1\frac{1}{10}$ per cent. and one-half per cent., respectively.

A discussion of these tables shows certain discrepancies which call for further experiments on larger specimens; but the general results agree in determining that Portland cement mortars contract when hardening in the air and expand when hardening in water. These results being greatest in the air, and in both cases greatest with pure cements.

In the work of the Department of Docks in New York, to obviate the irregular vertical cracks that formed when the bulkhead walls were made continuous, it was found to be necessary to leave vertical joints at spaces of about 150 to 200 feet. At these a shrinkage would be noticed of about three-quarters of an inch, but no cracks would occur elsewhere.

Reference is made also to the failure of monolithic pavements, until properly arranged joints were introduced.

The cracks occurring in some monolithic cement concrete lime-kilns from contraction was mentioned. The celebrated Vanne aqueduct, built twenty years ago in cement concrete in a monolithic mass, seems still to be contracting, and the leakages resulting are very serious. Several of the arches have had to be supported to prevent their fall. In all these cases it is suggested that properly introduced vertical joints would have delayed if not entirely prevented injury from the contraction.

The committee asked to be continued. A brief discussion followed. Mr. Prindle mentioned the fact that vertical cracks had appeared in a number of places in that part of the stone masonry of the new Brooklyn dry-dock which is above water. The dock is 600 feet long, and the suggestion is made that these cracks are probably the result of temperature changes. Remarks were also made by Messrs. Stauffer, Emery, Dorsey, and others.

There was also an informal discussion of the question of earthquakes as affecting structures, Messrs. Harris, Dorsey, and others taking part. Mr. Dorsey made the interesting statement that in one of a severe shock near Arequipa on the western coast of South America, in which a long section of railroad-track was made impassable, he had found a rail bent three feet out of line.

The death of Mr. E. S. Chesbrough was announced, and a committee appointed to prepare a suitable memorial.

PHILADELPHIA WATER REPORT FOR 1885.

SECOND NOTICE.

NOT the least interesting portion of this valuable book, which is the final report of Col. William Ludlow, U. S. A., is the report on the progress of the surveys for the future water-supply of Philadelphia by Rudolph Hering, the engineer in charge.

The work done during the year 1885 comprised the completion of the topographical surveys of the water-sheds of the Perkiomen, Tohickon, and Nesaminy Creeks and of the proposed aqueduct lines, and the maps of the same. The maps of the water-sheds cover 446 square miles platted to a scale of $\frac{1}{1875}$, with 10-foot contours, and showing all roads and buildings.

Other maps were compiled from various sources, and all reduced to a uniform scale by photography, and a preliminary map made covering a territory of about 2,000 square miles. The characteristics of the several water-sheds were collated from these maps and all available sources of information, and tabular comparisons made of the proportions of improved and virgin area, of length of roads, of population, of manufactories, of the features governing the relation of rainfall and flow of streams, of relative elevation, and of relative slope of surface.

The pollution of the streams was also investigated systematically, the amount of rainfall measured at twenty-four points, continuous stream-gaugings made at six points, and the summer flow at four others, besides numerous meter measurements of small streams and of the minimum flow of the Delaware and Lehigh Rivers.

The preliminary reports on these various matters are all full and interesting, but, pending the completion of the projected scheme of investigation and the collation of the results as a whole, extracts might only serve to mislead.

The heaviest rainfall recorded by an automatic recording gauge was at Doylestown on August 3, 1885, when 1.5 inches of rain fell in 20 minutes, and 4.40 inches in 1 hour and 43 minutes.

The final report of Mr. Hering will be looked for with interest. The scope of the investigations he has made has been so wide, and the scheme so carefully planned and elaborately carried out, that the conclusions drawn from the collation and compilation of the data cannot but be of great value to all who may desire to investigate the collection and distribution of water for public use.

Mr. Hering acknowledges the efficient service rendered by his assistants, Mr. F. L. Paddock on the topography, Mr. H. W. Sanborn on the hydrography, and Mr. D. C. Barber on the sanitary branch of the investigation.

FIRE-PROOF CONSTRUCTION.

BY F. COLLINGWOOD, M. A. S. C. E., AND M. INST. C. E.
No. VII.

(Continued from page 268.)

FLOORS.

THE importance of a well-constructed floor as a means of isolation and of resisting the spread of flames has been universally recognized.

As to what the material for a fire-proof floor shall be there is a great diversity of opinion. Undoubtedly one of the best materials for the beams is iron, if it can be protected. Chief Shay, of New York, expresses the opinion that a floor of iron beams, with brick or terra-cotta arches, will resist any fire likely to occur in a dwelling-house, even with the beams unprotected. While this may be true in most cases, it would be better to assume the opposite, and apply at least two inches of protecting material around the lower flanges. For a warehouse a greater thickness is desirable. Moldings can now be obtained in terra-cotta and a variety of other materials for this purpose. These moldings are so made as to completely incase the lower part of the beam, and are set in mortar, which, when hardened, holds them firmly in place. A mixture of plaster and cinders is often applied, also of asbestos and pipe-clay. Plaster of Paris is not desirable, on account of its high expansion when heated, and also because of its oxidizing effect, but the last trouble has been overcome by covering the iron with a wash of lime.

According to some recent experiments by Prof. Bauschinger, of Munich, beton of one part Portland cement and five parts sand remained entirely uninjured at a temperature of 1,100° Fah., and even when water was thrown on a column exposed to this temperature, and also to a heavy pressure, no harm was done. A column of brick-work in cement mortar resisted equally well.

An experience at the burning of a building near London Bridge, in 1851, shows that concrete floors will resist an intense heat. The *London Times*, speaking of the fire, says: "As floor after floor gave way, dropping their blazing contents into the stories below, the volume of flame increased. The immense mass of burning material at last rested on the floor of the story above the ground floor, where it burned intensely for a considerable portion of the day. It now became a matter of surprise that the ground floor, which contained very large stores of provisions, such as cheese, butter, bacon, etc., did not ignite." This was finally explained when it was made known that the floor above was a thick layer of concrete.

The use of a wire netting has been mentioned in a previous article. A netting is now on the market which consists of flat sheets of wire-cloth, with corrugations running lengthwise at intervals of six inches. The corrugations are about three-eighths of an inch deep, so that when the cloth is fastened to the under side of a timber, or the side of a room, it stands off from it, and allows the mortar or other material to surround the wire and take a firm hold. It can also be bent around the flange of a beam. Unlike all kinds of furring, it leaves no spaces through which fire can creep.

For mill floors, Mr. Edward Atkinson recommends as follows: Timbers to be 10"x12", or 12"x14", or 16", and spaced eight feet, nine feet, or ten feet four inches on centres. They may be solid or in two parts bolted together, and not over twenty-five feet span. The floor-planks to be grooved and splined, and to be three inches thick on the narrower bays, and four inches thick on the wide bay, with a top or wearing plank one inch thick. The work will be better and safer if mortar or asbestos paper is placed between the plank and the top floor. There must be no sheathing on the under side of the timbers to make a hollow floor, but sheathing, if required, must be nailed solid to the under side of the plank between the timbers. In dangerous departments wire lathing (netting) is fastened to the surface following the line of the beams and planking, and covered with plastering. Of course, timber which is unseasoned and not treated by some preservative process is liable to decay if tightly enclosed. For this reason some parties advocate well-fitted and tightly bolted solid timber floors, with no protecting material.

A novel form of floor has recently been brought out in San Francisco, which is illustrated, in its various uses in floors, roofs, and sidewalks, in Fig. 4. It consists in building floors in place out of concrete, into the lower part of which twisted iron rods are inserted. It is claimed

that while a plain rod affords no hold to the concrete, a twisted rod is held firmly, and that by this means the lack of tensile strength in the concrete is compensated for by the iron. The saving as compared with a similar use of iron beams is claimed to have been in cases where used over forty per cent. for floors of equal strength. The rod as twisted is shown in the cut, the rods varying in size from one inch to 1 3/4 inches square.

Beams three feet deep and two feet six inches thick, crossing 15-foot openings, have been used for the support

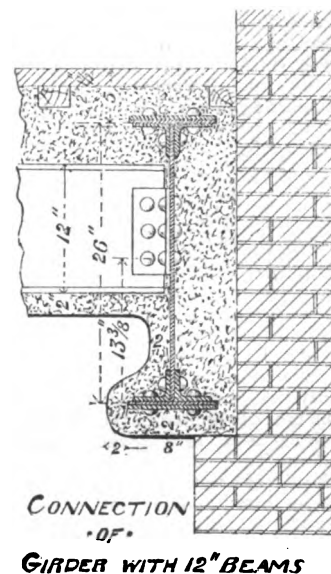
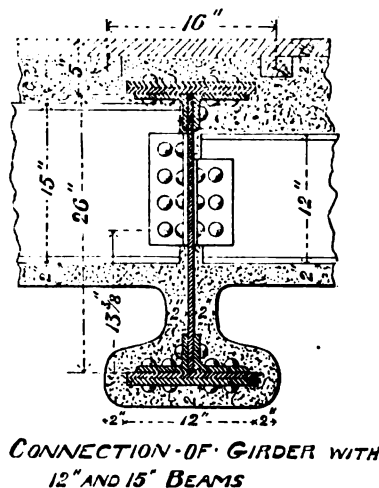
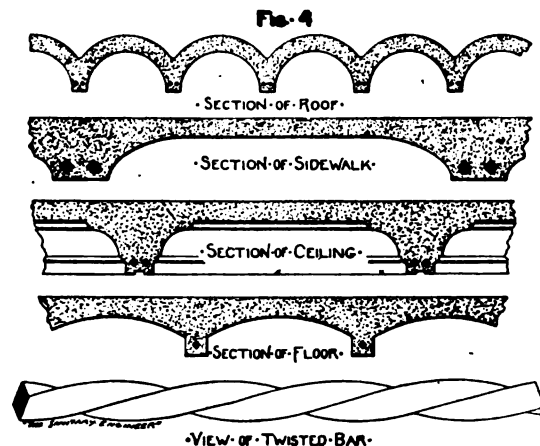
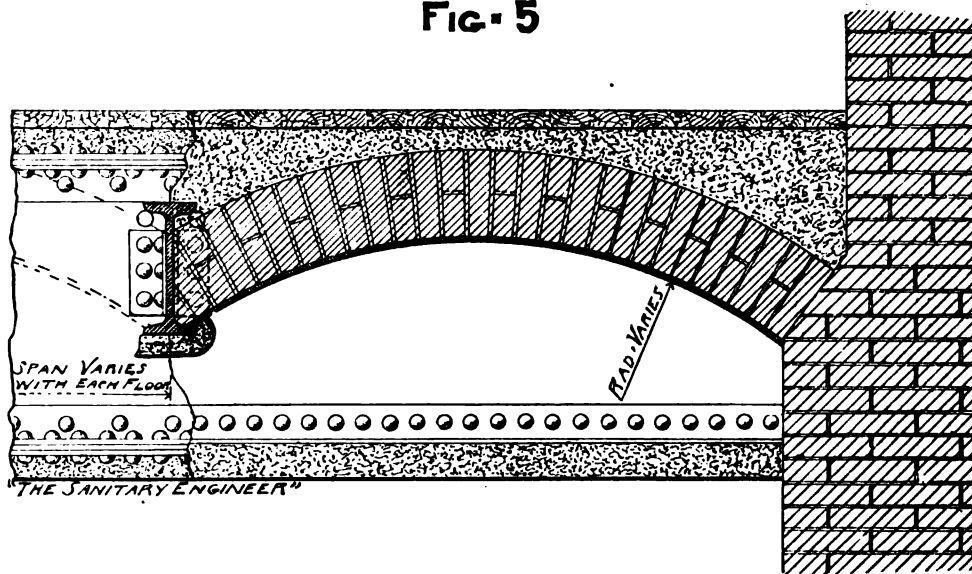


FIG. 5



of the front wall of a four-story brick building. The calculated breaking strength of such was 250 tons, distributed load; but this has not been tested.

By the use of "hollow brick" arches with flat intrados, it is claimed that floors can be made forty per cent. lighter than when laid in brick or concrete in segmental form between iron floor-beams, and they are certainly stronger than lime or plaster concrete blocks.

The "porous terra-cotta," made from a mixture of clay with some combustible matter in small particles (such as sawdust, charcoal, etc.) and burned, is coming into favor as a protecting material for beams, but not for use where strength is required. An experiment reported to the Wight Fire-Proofing Co. states that a block one inch

thick exposed to the heat from "a large blow-pipe" (presumably an alcohol flame) resisted for twelve minutes before a sulphur match was ignited from the heat on the opposite side. The side exposed to the flame was meantime fused to a glass.

Considerable use has been made of late of the Neuchatel and other rock asphalt coverings for floors in place of wood, as, for example, in the De Vinne Press building just finished in this city.

The best of these consists of a natural rock thoroughly permeated by bituminous matter. This is crushed to a fine powder, and when laid, sand or grit is added to give greater hardness. Although softened by a high heat, it burns very slowly, and will not communicate fire. The statement is made that "about ninety per cent. of it is earthy matter which would put out flame better than water." As it is proof against moisture and decay, and is elastic, it is being freely used in locations to which it is suited.

Mr. Cregier, of Chicago, suggests that in buildings which do not claim to be fire-proof, a great loss of property often occurs from damage by water coming through floors after being thrown upon a fire in an upper story (often percolating through brick arches), and that all floors should be calked and so arranged that water would run away without doing damage.

From the constant danger that a beam may be exposed

to flame by the fire-proofing material cracking off, it is evident that the use of wire netting is desirable around iron beams, even where hollow brick arches extend below them, since the broad flat surface of the lower flange gives no key to the cement or plaster applied to it. While wire netting covered with mortar—as shown by the fire detailed in No. VI. of these articles—furnishes a good protection while it remains intact, this fire shows that it is liable to become detached and expose the beams, etc., to the flames. It is for this reason the best authorities agree in saying, as Chief Shaw, of the London Fire Brigade, does, respecting all floors and ceilings: "It is essential that they should be solid, and not, as generally found, hollow, with air-passages inside." One of the evils of hollow spaces in

floors is illustrated by an example quoted by Mr. Atkinson. The owners of a jute mill applied for insurance. The building was of stone, with bare walls, but the floors and roof were sheathed underneath. Sixty feet away was a flax factory, and sixty feet further a locomotive works. No insurance would be granted until the sheathing was removed, and made into shutters covered with tin, as a protection against the adjacent risks. To the astonishment of the owners, when the sheathing was removed the interspaces above it were found to be packed with lint from the siftings of years of use, and several tons of it were removed. Subsequently the locomotive works and the flax factory were burned, but the shutters enabled the firemen to keep the fire out of the jute factory.

Figure 5 shows the form of fire-proof floor used in the warehouses under the New York approach of the East River Bridge. The floors were calculated to support safely 450 pounds per square foot, including the weight of the floors. The main beams ran across between the piers of the bridge, and as these piers were very heavy and the spans short, tie-rods could be omitted in the small beams, except opposite openings through the floor. The span of the brick arches was about four feet eight inches, with about eight inches rise, and it will be noticed that the bricks were always laid header and stretcher, and not in rings, thus making a bonded arch. The haunches were filled with concrete and the filling carried to a level surface at two inches thick on the crown of the arch, and on this 1½-inch Georgia pine planks were laid. The flooring was nailed to strips laid in the concrete. Every portion of the iron-work underneath was covered with a fire-resisting composition at least two inches thick, and the under side of the brick-work plastered and finished.

The iron-work surrounding openings was also encased in fire-proofing material, the latter being covered with an iron casing to preserve it from harm. It will be noticed that the ends of the main girders are sloping. This serves the double purpose of assisting in the insertion of the beam into its place, and, in the possible case of a fall from fire, preventing injury to the walls.

(TO BE CONTINUED.)

THE ALLEGED BREAK IN PROSPECT PARK RESERVOIR, BROOKLYN.

UNDER such a heading the daily papers in New York gave last Monday a very sensational article. Civil engineers, generally, were startled at the announcement, as it is quite generally known that one of the best known hydraulic engineers, Mr. Lane, then City Engineer in Brooklyn, was responsible for the plan and execution of the work. On inquiry we find that the reservoir is entirely intact, and the break is limited to the blowing off of a cover-plate from a 20-inch branch, and the starting of the lead in two or three joints in the force-main. The head of water above the point where the accident occurred could not have been more than thirty feet under normal conditions, but through some unexplained cause the pressure must have been much greater than this. As there is a large excess of pumping power above ordinary requirements the valve on the main at the reservoir was probably partly closed. The loss of water was very slight, and was limited to the small amount in the force-main above the leak, and the quantity pumped after it occurred before the engines were stopped.

ARTESIAN-WELLS ON THE NEW JERSEY COAST.

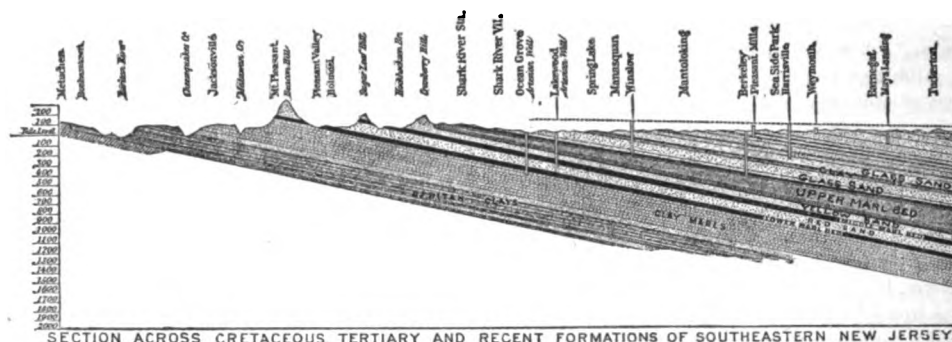
In our article on the water-tower at Asbury Park (issue of September 2) the fact was mentioned that the supply there was sensibly affected by continued pumping at the Ocean Grove well 600 feet away from the nearest of the Park wells. In order to show that the wells draw their water from the same source, we give below a copy of a partial geological section of the State from Metuchen on the line of dip of the strata through to Barnegat, the general direction being south 33° east.* The dip averages about 37 feet per mile. There are three marl-beds separated by beds of sand, each of which are water-bearing. The well at Ocean Grove passed through the following strata:

To a depth of	18 feet, sand and gravelly earth.
30 "	black clay for 12 feet.
60 "	black clay and grains of green sand 10 feet, black clay 34 feet.
82 "	lighter-colored clay and grains of green sand.
92 "	light-colored clay 4 feet, and pure green sand grains.
102 "	light-colored clay 2 feet, and fine-grained, light-colored stone.
110 "	light-colored plastic clay.
132 "	clay, ash-colored and flaky.
146 "	clay, ash-colored, with fragments of light-colored stone.
155 "	light ash-colored clay.
177 "	darker ash-colored clay.
185 "	black clay, coarse and free from mica.
195 "	black clay, micaceous.
229 "	black clay, micaceous, fine.
241 "	black clay, micaceous, coarse and rough.
268 "	sand, compact and greenish.

* See Reports of Geological Survey of New Jersey, by Prof. George H. Cook, 1883-4, from which the data for this article were taken.

280 feet,	broken shells, fragments of <i>Terebratula Harlani</i> .
300 "	grains of green sand and few shells.
303 "	dark greenish clay, compact.
327 "	dark greenish clay, sandy.
360 "	green sand and calcareous earth.
382 "	green sand grains, open sand and fossils (<i>Belemnites mucronata</i>).
397 "	petrified stratum 1 foot thick.
404 "	clay for the last 6 feet.
420 "	open sand for last 16 feet.

At the depth of 382 feet the water rose to 18 to 20 feet above the surface, the well being sunk to this depth without lining. A 4-inch tube was then inserted and properly set and the sand stirred for 38 feet further; several cubic yards of sand were also taken out. The quantity of water was in this way increased, and the jet rose to 28 feet above the surface. It will be seen that this well reaches water



in a "sand marl" just below the lower marl-bed, which has its outcrop about 12 miles north-westerly, and where the topographical map of the State shows the greatest depression of surface to be at least 50 feet above the surface at Ocean Grove.

The next well sunk was on private grounds at Asbury Park. This was 3,276 feet in a direct line from the first well, but only 2,316 feet measured on the line of dip. At 378 feet the sand was found to be very solid and continued so three feet further; then there were 10 feet of very loose sand, in which the water was found. The well is tubed with an 8-inch pipe for 372 feet.

A well at Red Bank, some nine miles west of north from Ocean Grove, was sunk to the same stratum, striking water at about 35 feet below tide. This is an open well 15 feet in diameter, resting on the marl at about 10 feet above the sand, and having five 36-inch cast-iron pipes penetrating the marl to the water-bearing sand. The water rose here to about 20 feet above tide (12 feet below the surface) and flows into the well at the rate of 250,000 gallons per day.

A 3-inch well was put down at Ocean Beach, about three miles south from Ocean Grove, striking the same water at about 480 feet. It is lined to a depth of 471 feet, and cost \$1,100. The pressure carried the water about 50 feet above tide (34 feet above ground), and the flow by actual measurement is 25 gallons per minute.

At Lakewood the same supply was struck at 475 feet from surface (425 feet below tide), and the water rises 17 feet above ground.

Other water-bearing strata have been found at Berkeley Arms, between Barnegat Bay and the ocean, at May's Landing, in Atlantic County, and at Weymouth in the same. The flow from a 5-inch pipe in the latter was 52 gallons per minute. At Pleasant Mills, in Atlantic County, a 3-inch well was sunk, the first 40 feet through sand and pebbles, the next 8 feet through tough blue and blue-black clay. When this was pierced water rose 13 feet above the ground. During the next three days enough sand was thrown out to fill a space of about 10'x10'x6', and the volume discharged was found to be at the level of the ground 124 gallons per minute. Afterward seven other wells were sunk at distances of 60 feet apart, and the yield from the whole eight is now about 300 gallons. The wells seem to be quite sensitive to each other, the closing of any one causing an immediate increase in the flow of the others.

The water from all the wells we have described is of excellent quality, soft, and remarkably free from impurities.

THE PLUMBING APPRENTICESHIP QUESTION IN NEW YORK.

A CONTEST has been going on in this city between the Master Plumbers' Association and the Journeymen's Union. During its progress the journeymen have been reticent, and it has been difficult to get any definite idea of the merits of the relative positions of the contending parties from the conflicting statements appearing in the daily

papers. A report widely published that the union would prevent boys from the New York Trade-School from joining the union at any time or working as plumbers, whatever their proficiency might be, has resulted in the journeymen losing much of the public sympathy. We are glad to learn that this report is untrue, as will be seen by the following letter sent to Colonel Auchmuty, the founder of these schools, which denies this imputation and shows a commendable spirit:

JOURNEYMEN PLUMBERS' SOCIETY,
114 EAST THIRTEENTH ST.,
NEW YORK, September 9, 1886.

MR. R. T. AUCHMUTY.

DEAR SIR: Your communication of the 3d inst., which was addressed to Mr. Edward Farrell, was received and read to our members.

The subject was referred to the secretary of the above-named organization for the purpose of conveying to you the sentiments of our society.

The journeymen have been placed in an entirely false position in this matter. It is the prevailing impression amongst our employers, and their employers, that the journeymen are actuated solely by a spirit of selfishness. This we most emphatically deny.

The journeymen plumbers are actuated by the very same feelings which prompt you to devote so much of your time, energy, and money to the New York Trade-Schools—not by selfishness.

To prove it, we are the only class of mechanics who have freely allowed every boy who is placed with us as an assistant to use the tools that are purchased by ourselves, not by the employers. I am under the impression that no fair-minded man can accuse the journeymen plumbers of selfishness, after considering the fact that they have always been willing to transmit to young men the knowledge that we ourselves have acquired after long years of labor and study, and are still willing to do so.

But, after all our willingness, owing to the absence of some definite system of apprenticeship, we have not brought the trade to the standard desired by all its admirers—namely, the propagation of an intelligent and competent class of mechanics. We have come to the conclusion, after several years of the most considerate, unselfish, and unbiased agitation, that this cannot be done anything like thoroughly unless there are some restrictions placed upon the number of boys who endeavor to learn this very important trade.

By limiting the number to one boy to four men as a minimum, we are enabled to keep track of that boy and to be certain that he will become a competent and reliable mechanic. If this system, which we are endeavoring to introduce, becomes the rule in this city, it is to be seen very readily that the effect will be to benefit, first, the boy who becomes indentured, inasmuch as he will become a mechanic in the true sense of the word; it will be a benefit to the employer, for the simple reason that he will have a perfect mechanic to do first-class work, always allowing that an honest employer who contracts to do a job will not have it done otherwise; and, above all, it will insure the health of the commonwealth, a great part of whom are existing under a false sense of security, owing to the vast amount of "botch" work which is constructed in this vicinity every day. This may be attributed to the pernicious system heretofore fostered by the employing plumbers.

This is our whole position fairly put in regard to the existing trouble between the employers and the employees. As regards our position toward the New York Trade-Schools, we have never done anything which would lead you to believe that we are opposed to your schools, or to kindred institutions; on the contrary, it is our intention to recommend to all indentured apprentices the advisability of attending your institution. Being confident that you

will give this the consideration due a subject of so much importance to the trade at large, I am,

Very respectfully yours, W. T. FLOOD,
Secretary.

As explained to us, the journeymen's idea is that if the practical work of plumbing is to be done by competent workmen there must be some control over the men learning the trade and some limit to the number. The Masters' Association have recognized that principle in agreeing to recognize the union in the matter of wages and hours, and practically they have done so when they name the proportion of apprentices to journeymen. Clauses 5 and 6 of the journeymen's demand, which seem to be the bone of contention, are as follows:

"5. That this association shall have a voice in the selection of all apprentices.

"6. That each apprentice shall be obliged to pass an examination under a board of directors appointed by this organization for that purpose, and be compelled to register and report to the same quarterly."

It is quite probable that in framing these clauses the journeymen had in mind mainly a desire to have some record of these apprentices, to see that they are not deceived and to know what the annual accession to the ranks of journeymen would amount to. If the union is recognized as having a voice in the fixing of wages and hours it would seem only proper that they be kept informed of the number of apprentices. The Masters' Association, in their essays, have frequently pointed out the danger and annoyance to which the public are subjected and the demoralization resulting to the trade from the practice of the last fifteen years of taking boys as they need them, and these boys, after one or two years, either leaving for higher wages or being sent adrift, undertaking and attempting work as journeymen. This evil is undeniable. The problem is how to mitigate it with the least possible interference with every man's right to conduct his own business.

Alleged acts of oppression on the part of the Journeymen's Union on the one hand and threats on the part of the masters on the other have so strained the relations existing between them that this may be an inopportune time to attempt a calm consideration of the matter. When such a time does come, however, an agreement might be reached that might be a step in the right direction.

First—If clauses 5 and 6 were changed so as to require that particulars of every boy indentured shall be filed with the Journeymen's Union.

Second—That boys who have served as apprentices hitherto shall be allowed to continue using tools or as apprentices to complete their five years, their names, with particulars, etc., also to be filed with the Union.

Third—A graduate of the Trade-School should be allowed something off from his term of five years.

Fourth—The proportion of new apprentices to be taken on to be agreed on and to go in force from some future date.

The number agreed on should be for (say) one year. Then experience can suggest if the proportion is too great for the real good of the public and the craft or too small to be just to the interests of American boys.

REGARDING INDENTURING APPRENTICES IN NEW YORK STATE.

The Journeymen's Union, ascertaining that there was likely to be opposition on the part of masters to agree to board and pay for medical attendance of apprentices—as might be feasible in a village community, but would not be practicable in cities at this period—submitted the matter to their counsel and received from him the following opinion and draft of an agreement to meet this objection, to be executed with the other indenture papers:

To the Journeymen Plumbers' Association.

GENTLEMEN: The blank forms of apprentice's indentures submitted to me conform strictly to the law of 1871, and under that law I cannot see how any improvement can be made.

The law of 1871 is based upon portions of former laws which were enacted when it was common for the apprentice to board with his employer, which custom is, to a great extent, carried on at the present time in rural communities.

In the city of New York it would be almost impossible to carry out the spirit of a portion of the third subdivision of section second. I refer to the clause which compels the employer to provide board, lodging, and medical attendance,

and yet this section must be inserted in the blank form to make it operative. [See copy of law elsewhere.]

To relieve the employer from board, lodging, and medical attendance it will be necessary to enter into a further contract between the employer and the parent or guardian. This contract should be in form that the parent or guardian, in consideration of one dollar and the benefits to be received by his child or ward from the employer, shall board, lodge, and furnish medical attendance during the period of apprenticeship, and hold the employer harmless from any liability that he has assumed in the apprentice's indenture.

In regard to an apprentice who arrives at majority before his time of apprenticeship has expired, there is no law binding him to continue, but it is within the province of your organization to adopt such rules as to his further promotion that will continue him under his contract, or, in default thereof, refuse him all future rights and privileges of your society.

Respectfully yours,

CHARLES D. METZ,

7 Warren Street, New York. Counsellor at Law.

The blank of Thomas J. Byrne, received since writing the above, does not conform to the law of 1871, and under that law is inoperative.

C. D. M.

FORM OF AGREEMENT PROPOSED.

THIS AGREEMENT, made the.....day of.....188.....

Between.....party of the first part, and.....party of the second part,

WITNESSETH, that in consideration of the indenture of apprenticeship made by and between.....employer,.....parent or guardian, and.....apprentice, and dated the.....day of.....188.....

the party of the second part agrees, during the continuance of the said indenture, to furnish said apprentice suitable and proper board, clothing, lodging, and medical attendance, for which the party of the first part agrees to pay the said apprentice (which payments are made with the full consent of the party of the second part) the following sums of money—namely:

For the first year.....dollars per week.

For the second year.....dollars per week.

For the third year.....dollars per week.

For the fourth year.....dollars per week.

For the fifth year.....dollars per week.

And for the true performance of all and singular the covenants and agreements aforesaid, the parties hereto bind themselves each unto the other firmly by these presents.

IN WITNESS WHEREOF, the parties aforesaid have hereunto set their hands and seals this.....day of.....in the year of our Lord one thousand eight hundred and eighty-

[SEAL.]

[SEAL.]

STATE OF NEW YORK,
CITY AND COUNTY OF NEW YORK, } ss.

On this, the.....day of.....188.....before me personally came.....

and.....to me known and known to me to be the individuals mentioned and described in the foregoing instrument, and severally acknowledged that they executed the same.

Notary Public, N. Y. City.

APPRENTICE LAW OF NEW YORK STATE.

CHAPTER 934. AN ACT IN REFERENCE TO APPRENTICES AND EMPLOYERS. PASSED MAY 27, 1871.

The People of the State of New York, represented in Senate and Assembly, do enact as follows:

SECTION 1. On and after the passage of this act it shall not be lawful for any person or persons in this State to employ, or take as an apprentice, any minor person to learn the art or mystery of any trade or craft, without first having obtained the consent of such person's legal guardian or guardians; nor shall any minor person be taken as an apprentice aforesaid unless an agreement or indenture be drawn up in writing, in accordance with the provisions of this act, and duly executed under seal by the person or persons employing said apprentice, and also by the parents or parent, if any be living, or by the guardian or guardians of said apprentice, and likewise by said minor person so becoming an apprentice.

SEC. 2. Said agreement or indenture, in order to make the law valid, shall contain the following covenants and provisions:

1st. That said minor person shall be bound to serve his employer or employers for a term of not less than three or more than five years.

2d. That said minor person so indentured shall not leave his said employer or employers during the term for which he shall be indentured; and if any said apprentice so indentured as aforesaid shall leave his said employer or employers, except as hereinafter provided, the said employer or employers may compel the return of said apprentice under the penalties of this act.

3d. That said employer or employers shall covenant and agree in said indenture to provide, at all times during the continuance of the same, suitable and proper board, lodging, and medical attendance for said apprentice, and said employer or employers shall also further covenant and agree to teach or cause to be carefully and skillfully taught to his or their said apprentice every branch of his or their business to which said apprentice may be indentured, and said employer or employers shall be further bound, at the expiration of said apprenticeship, to give said apprentice a certificate in writing, stating that said apprentice has served a full term of apprenticeship of not less than three or more than five years, at such trade or craft as may be specified in said indenture.

SEC. 3. Any person or persons taking an apprentice without complying with the provisions of this act, shall be deemed guilty of a misdemeanor, and on conviction thereof in the Court of Sessions of General or Special Sessions, held in and for the County in which the business of said employer or employers may be conducted, shall be subject to a fine of not less than five hundred dollars, the fine to be paid to the Treasurer of said County for the use and benefit of said County.

SEC. 4. Any and all indentures made under and in pursuance of the provisions of this act shall not be canceled or annulled before the expiration of the term of said indentures, except in case of death; or, by the order or judgment of the County or Supreme Court of this State, for good cause, and any apprentice so indentured, who shall leave his employer or employers without his or their consent, or without sufficient cause, and shall refuse to return, may be arrested upon the complaint of said employer or employers, and taken before any magistrate having jurisdiction of misdemeanors, who may cancel said indentures, and, on conviction, commit said apprentice to the House of Correction, House of Refuge, or County Jail, in and for said County, for such length of time as such magistrate may deem just, or until such apprentice shall have attained the age of twenty-one years; and in case said apprentice so indentured shall willfully neglect or refuse to perform his portion of the contract as specified in said indenture, then said indenture may be canceled in the manner aforesaid, and said apprentice so violating said indentures shall forfeit all back pay and all claims against said employer or employers, and said indentures shall be canceled.

SEC. 5. Should any employer or employers neglect or refuse to teach or cause to be taught to said apprentice the art or mystery of the trade or craft to which said apprentice has been indentured, or fail at any time to provide suitable and proper board, lodging, and medical attendance, said apprentice individually, or his parent or parents, guardian or guardians, may bring an action against said employer or employers to recover damages sustained by reason of said neglect or refusal, and if proved to the satisfaction of the Court, said Court shall direct said indentures to be canceled, and may impose a fine on said employer or employers, not exceeding one thousand and not less than one hundred dollars, and said fine shall be collected and paid over to the said apprentice or his parent or guardian for his sole use and benefit.

SEC. 6. Any indentures made and executed wherein parts conflict with or are not in accordance with the provisions of this act, shall be invalid and without any binding effect.

SEC. 7. All acts or parts of acts inconsistent herewith are hereby repealed.

SEC. 8. This act shall take effect immediately.

AGREEMENT between.....and.....a minor of the age of.....by and with the consent of.....his legal guardian, WITNESSETH: That the said.....has voluntarily and of.....own free will and accord put and bound himself.....apprentice to learn the art or mystery of the trade or craft of.....and as an apprentice he covenants and agrees to serve from this date, for and during, and until the full end and term of.....next ensuing, and hereby covenants not to leave his said employer during said term, and during all said time, the said apprentice.....employer faithfully, honestly, and industriously covenants to serve;.....secrets to keep, all lawful commands everywhere readily obey, and at all times protect and preserve the property of.....said employer and not suffer or allow any to be injured or wasted; and he will not buy, sell, or traffic with.....own goods, or the goods of others, nor be absent from.....said employer's service day or night, without leave, and in all things behave... as a faithful apprentice ought to do, during the said term. And the said employer covenant to use and employ the utmost of.....endeavors to teach, or cause.... the said apprentice to be carefully and skillfully taught or instructed in every branch of the art or mystery of the

trade or craft of.....

AND the said employer further covenant to provide, at all times during the continuance of said term, suitable and proper board, lodging, and medical attendance for said apprentice, and at the expiration of said apprenticeship to give said apprentice a certificate in writing, stating that said apprentice has served a full term of apprenticeship of

AND for the true performance of all and singular the covenants and agreements aforesaid, the parties bind themselves each unto the other firmly by these presents.

IN WITNESS WHEREOF, the parties aforesaid have hereunto set their hands and seals, the.....day of..... in the year one thousand eight hundred and....

Sealed and delivered in the presence of

.....Employer.
.....Apprentice.
.....Parent.
.....Legal Guardian.

I do hereby consent to and approve of the binding of my.....as in the above Indenture mentioned.

The above suggestions are made on the assumption that masters are willing to indenture apprentices. That the journeymen have been in earnest in striving to secure the indenturing of apprentices legally is evident from the foregoing which they have furnished THE SANITARY ENGINEER for publication. The matter is certainly of interest to every one who has any regard for the mechanic of the future. Since it is possible that there may be further questions requiring legal consideration, it would seem desirable that the two associations, when they are ready to treat with each other, should each have their counsel to arrange and agree on the proper forms. This is a matter for lawyers to settle, and not for a convention or committee of mechanics.

JOURNEYMEN PLUMBERS' NATIONAL ASSOCIATION NOT TO AFFILIATE WITH THE KNIGHTS OF LABOR.

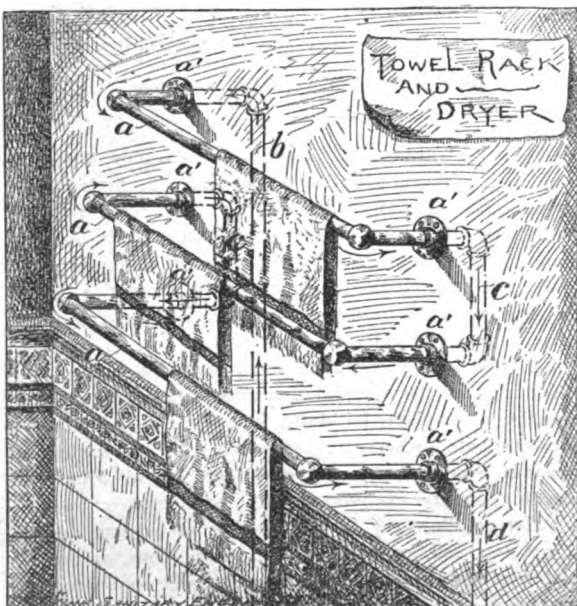
THE following dispatch was sent out by the Associated Press last Saturday :

"Chicago, September 11.—The International Association of Plumbers, at its session here yesterday, decided by an overwhelming vote not to join the Knights of Labor. A delegation representing the highest authority among the Knights was present while the subject was under discussion."

Novelties.

TOWEL RACK AND DRIER.

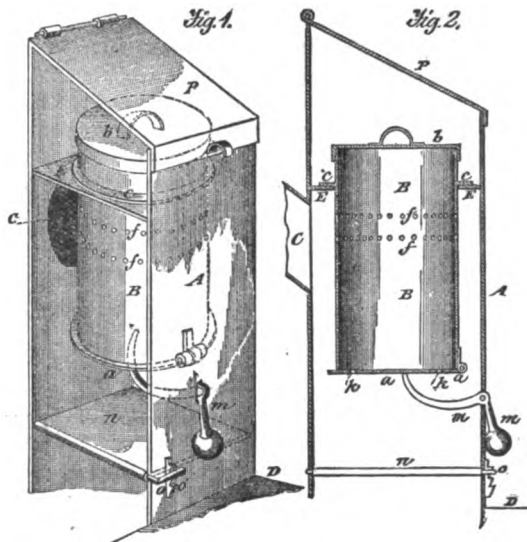
DURING a visit to Great Britain, this summer, the writer saw used as a towel-rack some brass tubing through which hot water flowed. It was connected with the hot-water system of the building. The accompanying sketch



is given merely to illustrate the idea. The hot water enters at the upper bar and passes out at the lower. Messrs. Wallace & Connell, of Glasgow, showed us the arrangement, which they had designed and executed.

GARBAGE ATTACHMENT FOR DOMESTIC RANGES.

THIS illustrates a domestic garbage-burner intended to be attached to a kitchen range. A is a compartment of the range which holds the garbage receptacle B, supported by flanges c, E. The compartment B is provided with perforations k, in a hinged bottom a, a movable top b, and side perforations f. M is a weighted lever that supports the hinged bottom a. The compartment A is provided with a hinged damper, n, locked by a crank-arm, o, and rack o', also with a hinged cover, P, and a smoke-flue, C. The cover P may be lifted, the cover b removed, and



the garbage placed in receptacle B, or the latter may be carried to the most convenient place for receiving the garbage, and, after receiving it, replaced in the compartment A. The covers b P are then replaced, and the damper n opened, to let in the heated products of combustion around the receptacle B. Any liquids which may be in the garbage find their way, through the bottom holes, k, into the fire, while the gases or vapors rising from the garbage escape through the side holes, f, into the compartment A, and thence into the smoke-flue C. After being subjected to heat and deprived of more or less of its moisture the outer end of lever m is raised, and the garbage dropped into the fire.

The inventor and patentee is Mr. Glenn Brown, of Washington, D. C.

Correspondence.

A COATING FOR LEAD-LINED TANKS WANTED.

PHILADELPHIA, September 8, 1886.

SIR: Will you be kind enough to advise me what is the best thing to coat a lead-lined tank with? The object is to prevent the lead from being acted on by the water. Hoping to hear from you, I remain,

L. O. H.

[We repeat an answer formerly given to a similar question :

"We know of nothing better than what is sold as 'black varnish.' There are two different articles sold under this name. One has a basis of coal-tar, and when used may be diluted with naphtha; the other has a basis of natural asphalt, and may be diluted with spirits of turpentine. We do not know that one is more durable than the other. The tank should be perfectly dry when the paint is applied. We do not know how long, at the longest, such a coating will last, but it can be renewed at a trifling expense whenever the tank is cleaned."]

HOW TO PREVENT NOISE FROM BALL-COCKS.

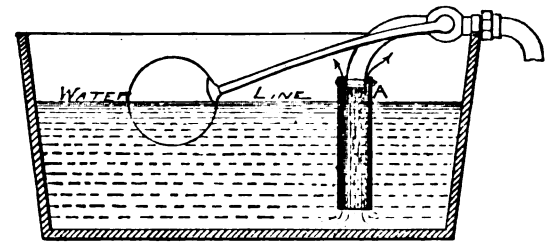
HARTFORD, CONN., September 9, 1886.

SIR: To overcome the hissing sound in a water-closet tank, I am advised to bring the supply-pipe under the water. Is that the best remedy? Is there any objection to it?

ARCHITECT.

[The proper way is to extend from the ball-cock a "hush-pipe" to near the bottom of the tank. The hush-pipe here suggested, it will be noticed, has an air-space where it is hung on the nozzle of the ball-cock. This is to prevent the water from being syphoned out through the ball-cock if water is drawn below and the pressure is insufficient to maintain a head at all points. This can also be prevented

by having a hole in the hush-pipe at A (when it is soldered to the ball-cock), the only risk being a possible closing of the hole by floating matter. There is always more or less



SECTION

noise from ball-cocks, hence water-closet cisterns should be covered and enclosed (with an air-vent in the cover) if this noise is found to be annoying. The cover should also be constructed so as to be readily removable.]

STEAM-PIPING FOR CHURCH-WARMING.

ELMIRA, N. Y., September 2, 1886.

SIR: In one of your papers some time ago I saw an article on church warming, and of placing pipes under the seats of the churches. Two plans were shown, one where the water of condensation returned to the main in the same pipe, Fig. 1.

There was also the better plan where a circulation was obtained and connections made with the steam and return mains, Fig. 2.

FIG. 1

FIG. 2

FIG. 3

I dislike the first plan on account of the risk of noise, and the second plan, I think, in many cases would give too much heat. I am heating a small church here having eighteen pews, with one 1 1/4-inch pipe under each side, and connected at each end with the steam and return mains. Fig. 3.

To my mind both plans, Nos. 2 and 3, will be air-bound unless there is an air-valve under each seat. Will you kindly give me your opinion on this matter, how to guard against trouble from air in plan No. 3? Thanking you for the advancement of our fellow-craftsmen, I am, sir,

Yours truly, STEAM-FITTER.

[We are of the opinion that the question of air-binding is not a serious one in any of the three plans proposed. There is no necessity for an air-valve or pet-cock under each seat, but it would be well to see that the mains and return were vented in the usual and conventional manner at high points, or where the judgment of the experienced engineer suggests. The first plan (Fig. 1) is a pipe divided by a diaphragm. These pipes will circulate to a considerable length, varying with the diameter used, and with a 2-inch pipe should circulate without trouble for the length of any ordinary pew. If the main from which they radiate is large the water will run back into it without trouble. This main, of course, should pitch downward—that is, the flow of the water and the steam should be in the same direction, with a return-pipe from the lower end of the main back to the boiler. Air being much heavier than steam under the same pressure will go down before it, provided it is not drawn off at the highest point when it may be drawn off at the lowest, provided the steam-pressure is above atmosphere.

With the second plan one-half of the water of condensation runs into each pipe—main and return—but the loops will not remain air-bound if there is a good vent on the lower end of each pipe—steam and return—but well above the water-line. The steam and return pipes should both pitch in the direction so that steam will enter high and return start high, taking a return-pipe below the floor back to the boiler. There may be more pipe in No. 2 than you require to a seat or pew, but in very cold latitudes it may be very desirable. Then there is nothing to prevent one from using small pipe, say 3/4-inch, and a short loop to reduce the surface. With plan No. 2, also, the mains may be above the floor in double pews—one at each side of the partition.

Plan No. 3 is all right, presuming the mains are below the floor, but it is not necessary to use 1 1/4-inch pipe

for the sake of circulation alone, as 1-inch will work equally well in all except furnishing as much surface for an equal length of pipe.

Air will not trouble in plan No. 3 provided you pitch both pipes in the same direction, taking steam at the high end of the main and returning to the boiler from the low end of the return, and using an automatic air-valve on both high and low end of the return-header, provided your piping is straight and entrapped with a relief-pipe in the end of the steam-main.]

RYE GRASS SEED WANTED FOR USE ON SEWAGE FIELDS.

CITY ENGINEER'S OFFICE,
SACRAMENTO, CAL., August 26, 1886. }

SIR: Please inform me where I can get a small quantity of the seed of the rye-grass used in connection with sewage irrigation, and oblige, Yours truly,
L. F. BASSETT, 1708 O Street.

[Referred to our readers.]

THE VITAL STATISTICS OF GLASGOW.

IN a study of the vital statistics of Glasgow for the years 1880-81-82, recently published by Dr. J. B. Russell, the Medical Officer of Health, the relations between the mortality-rates in different portions of the city and the condition of the inhabitants are strongly brought out. Taking the twenty-four statistical divisions of the city, he shows that the death-rate increases with the proportion of inmates per inhabited room. The amount of difference between the extremes is very striking. Thus, in Blythswood, with a population of 26,789, a mean of 1.25 persons per room, and a percentage of Irish born of 5, the mean annual death-rate was 16.1, and of children under five years 52.9, the birth-rate being 23.2. In the district of Bridgegate and Wynds, with a population of 7,798, a mean of 2.946 persons per room, and a percentage of Irish born of 32, the mean annual death-rate was 38.3, and of children under five years 138.7, the birth-rate being 37.1.

In all the districts the death-rate has diminished within the last ten years, and this is no doubt largely due to the extensive improvements which have been made in widening streets and demolishing rookeries of various kinds. The fact that improvement in healthfulness has occurred in every district shows, as Dr. Russell remarks, that the displacement of the inhabitants of the central parts of the city has not injured the health of the districts into which they have removed. This is a practical answer to the objection made to the demolition of rookeries that "the habits of these people are so bad that they will be unhealthy anywhere."

One of the darkest features of the Glasgow statistics is the large proportion in certain districts—and especially among infants—of deaths where no certificate of the cause is furnished, indicating that a large number die without medical attendance, and also the probability of crime in many cases. In the worst district over half the infantile deaths were uncertified. While great improvements have been made within the last ten years, it is evident that there still remains much to be done, and that the municipality cannot yet afford to rest and be thankful. Moreover, a health officer cannot do better work than to induce the city authorities to take up and continue a steady course of improvement, and to do this not by vague denunciations and essays on the evils of filth, etc., but by figures and facts which show the amount and locality of the evils to be dealt with, as Dr. Russell has done in his valuable report.

DRAINAGE OF THE LAKE KOPAIS.

A TELEGRAM from Thebes announces the inauguration of the Kopaïs Canal, which has lately been constructed for giving an outlet to the lake of the same name. The drainage of this lake is one of the most important works for the reclamation of land that has been carried out of late years, and may be compared to that of the Lake of Fucino, in Italy, which was successfully completed by Prince Torlonia some time since. The basin of this lake receives annually a no less quantity than 300 millions of cubic metres (10,595 cubic feet) of water, and the large extent of land thus constantly submerged, renders it unfit for cultivation, and the stagnant water made the whole district a most unhealthy one, as it produced pestilential exhalations during the summer months, which infected and poisoned the air for miles around. These marshes, it is expected, will soon become a most fertile district, and the waters will be stored and utilized in dry seasons for the irrigation

of about 7,000 hectares (17,298 acres) of land, and the canal will furnish abundant water-power, which can be eventually utilized for industrial purposes. The total area of land drained by the canal is about 25,000 hectares (61,778 acres).—*Society of Arts Journal*.

THE *American Architect*, in its issue of September 11, presents on three double pages sketches of eighteen buildings designed by the late H. H. Richardson, with the following explanation: "Illness cut short the task we had set ourselves of preparing a memorial issue of the *American Architect* which should contain such personal tributes to the late H. H. Richardson as his friends and fellow-architects desired to pay. When we were once more ready to go on with the work, we learned that his immediate friends desired to have prepared a more elaborate memorial biography, and as there seemed to be a feeling that what we proposed to do might be in some way prejudicial to the success of the more serious enterprise, we willingly abandoned our undertaking and placed at the disposal of the biographer selected, Mr. Schuyler Van Rensselaer, the material already collected. As this could not apply to the sketches we had had prepared of the most important of Mr. Richardson's buildings, they are published in this issue without comment or description."

AMERICAN canned goods are being imported into France so rapidly and in such quantities as to alarm the producers of that country. As a result of this, we shall probably see a revivification of all the instances reported in the daily papers in past years of poisoning from these articles, some of which may have been due to the negligence of those engaged in the canning process, but most of which were undoubtedly due to carelessness or want of thought in the consumer. That the contents of some of the millions of cans annually put up for market in the United States should spoil is not to be wondered at, inasmuch as every housewife has the same experience in her domestic preserving; but in most of the instances where sickness has occurred from the consumption of such goods, the color or the taste gave ample warning.—*Science*.

UNDER date of September 10 the Mississippi State Board of Health reports that "inspectors at Biloxi telegraph us on the 8th inst. that all the former sick are now well. The work of disinfection has been most thorough and complete, and other sanitary measures carried out. They express the opinion that there is no necessity to continue the quarantine. We replied that we deem it best to keep those who have been exposed under surveillance until noon Sunday next, which will be the tenth day since the last case occurred, when, if no new cases occur, all restrictions will be removed."

A BARK arriving in Boston last Saturday from Matanzas reported the death of four of the crew while at Matanzas from yellow fever.

THE New Jersey State Board of Health has requested the State local boards to endeavor to obtain evidence against physicians who fail to file a report of births as specified by law. A request is also made that local boards adopt a system whereby a full and accurate report may be obtained of all houses, together with their location, wherein contagious diseases have existed, or do now exist, with a view to securing more positive evidence concerning the ownership of such dwellings and the abatement of the disease by reason of sanitary improvement. The State Board also urges the appointment of a thorough veterinary surgeon, whose duty it shall be to visit and inspect every dairy at least twice in each year. This is especially desired in consequence of the presence of pleuro-pneumonia among cows to an alarming extent of late and as a better guarantee that the product of such diseased animals will not be disposed of for public use.

THE Boston and Albany Railroad will soon make a test of the Martin system of heating passenger-coaches with steam from the locomotive.

It is reported that the National Convention of Journey-men Plumbers in Chicago has directed the opening of co-operative plumbing shops by journeymen in this city, and that this will be done at once.

VICKSBURG, MISS., BOARD OF HEALTH.

THE Mayor and Aldermen has appointed Drs. R. O'Leary, S. D. Robbins, and T. G. Birche a board of health.

Reviews of Books and Pamphlets.

TRANSACTIONS OF THE NEW ENGLAND WATER-WORKS ASSOCIATION during the year 1885. Newton, Mass., 1886. Large 8vo., pp. 240.

This handsomely printed volume preserves in convenient form the proceedings of the thriving association of managers of water-works in the New England States during the year 1885. The order of the arrangement of the contents is somewhat confusing to one who seeks a continuous record of the action of the association, as the volume has no table of contents, and the June meeting comes first, followed by the record of the January meeting, and then of meetings held in April and September, the whole interspersed with programmes of junketings, statistics of city water-works, and reports of after-dinner speeches in a manner calculated to bewilder any one.

There is a good deal of interesting matter in the papers read and the discussions had upon them, but we would suggest that a careful editing of the discussion and the elimination from the stenographic reports of a great deal of the rambling talk, which sounds well enough in an impromptu talk, but is very fatiguing to read, would be a very good step for the Publication Committee to take.

The practical water-works engineers and superintendents of the country are very glad to get at the ideas of Howland, Ellis, Brown, Billings, and others, but they don't want to wade through such a lot of irrelevant matter to get at those ideas, nor do they care to know what the association eat and drank at Young's Hotel.

The first paper is one on weights of cast-iron pipe, by Albert F. Noyes, C. E., of Newton, Mass., discussed by Messrs. Howland, Joy, Lovell, Darling, Billings, Chase, Sherman, Holden, Parker, and Brown in an interesting manner.

Mr. Billings, of Taunton, led off a lively discussion on the necessity of tanks in houses for supply to water-closets and boilers.

Mr. J. Henry Brown opened a discussion on flushing street-mains, which brought out a good deal of valuable experience. Mr. Hall, of Quincy, discussed the merits of different materials for main pipes.

One of the most valuable papers presented was a report by Messrs. Billings and Coggeshall on uniformity in the preparation of annual reports of water-works. The suggestions they presented were embodied in a little pamphlet representing a typical report, and we are glad to see that a good many of the New England towns have adopted the form proposed, and in their reports for the past year have presented their statistics in a nearly uniform manner. We wish we could say as much regarding the compliance of members of the American Water-Works Association with the suggestion of a similar committee of their body made also last year at their annual convention in Boston.

REPORT OF THE MEDICAL OFFICER OF HEALTH ON THE SANITARY CONDITION OF NEWCASTLE-UPON-TYNE for the year 1885. 133 pp., 8vo. Newcastle. 1886.

This report, by Dr. H. E. Armstrong, contains a full account of the vital statistics of the city, with an analysis of the mortality statistics for the preceding ten years and a special report upon the water-supply. The death-rate for 1885 was 26 per 1,000, the mean rate for ten years having been about 24. This is a high rate for a city of 150,000 inhabitants. Of the total deaths registered from 1874 to 1883—34,480—the greater number were reported as due to the following causes in the percentages stated for each—viz.: Phthisis, 9.71; bronchitis, 9.36; atrophy and debility, 6.69; heart disease, 5.47; convulsions, 5.26; old age, 4.63; diarrhoea, 4.56; scarlet fever, 3.94; typhoid fever, 1.23.

During the year 1885 there were reported by physicians to the Health Department 70 cases of small-pox, 9 of typhus, 253 of typhoid, 1,227 of scarlet fever, and 93 of diphtheria. In a total of 1,130 infected houses the isolation adopted in 1.6 per cent. is reported as fair, in 13 per cent. moderate, in 43 per cent. imperfect, and in 41 per cent. there was no isolation.

A house-to-house inspection was completed in the city in May, having been in progress for two years, and its utility is shown by the large number of defects noted and to a great extent corrected. There seems to be comparatively little overcrowding in the city. The report is handsomely printed and creditable to the Health Officer.

ST. MARYLEBONE INFIRMARY, NOTTING HILL, LONDON. Description of the hospital by H. Saxon Snell. 15 pp., 2 plates, 8vo. London: Botsford. 1886.

The St. Marylebone Infirmary is one of the newest large hospitals in London, having been opened in June, 1881. The site covers 4½ acres, and of this about 1½ acres are covered by the buildings, which provide accommodation for 744 sick and 86 resident officers and servants. The cost of the buildings, including that of a nurses' home recently built, was £130,000, or about £175 per bed, which is much below the cost of average hospitals of this size recently built.

The wards are contained in four double pavilions, each three stories in height, and each containing on each floor two large wards each 84 feet long, 24 feet wide, and 13 feet high.

The heating is effected by double open gates placed in the centres of the wards and having water-backs with coils of hot-water pipes over which fresh air is brought into the room. Fresh air is also brought into the room through perforated zinc panels along the sides near the floor behind the heads of the beds. As this air is not warmed, it is not an arrangement suited to a cold climate.

The pamphlet is one that will be found useful by those interested in hospital construction.

Notes.

For works for which proposals are requested, see also the "Proposal Column," pages 365 and 366.

CONSTRUCTION.

KENT, O., WATER-WORKS.—In our Proposal Column will be found particulars of a proposal to build water-works for the Kent Water Company, Isaac S. Cassin, Engineer. Among other things the following quantities of cast-iron water-pipe are wanted: 334 lengths of 12-inch, 84 lengths of 10-inch, 605 lengths of 8-inch, 1,326 lengths of 6-inch, and 1,142 lengths of 4-inch.

LYNN, MASS., Aldermen passed an order last week directing the public board to furnish water to Swampscott at 17½ cents per 1,000 metered gallons.

RALEIGH, N. C.—The Board of Aldermen, on September 9, after discussing the report of the committee recommending the making of a contract for water-works with the National Water-Works Construction Co., adopted a resolution referring the matter of purity of contemplated sources of supply to the county board of health. Meantime, no action is taken on the contract award.

DRY-DOCK IMPROVEMENTS.—Civil Engineers Menocal and Asserson have made an examination of the dry-dock at the Brooklyn Navy Yard with a view to reconstruction, for which Congress has made an appropriation of \$100,000. The pumping-engines also will be put in order.

NEWPORT, R. I.—At the city election, September 8, the proposition to complete the outlet sewer was carried in every ward.

ARTESIAN WELL.—The Deming, N. M., Artesian Water Co. asks for proposals for completing the well already begun here. The drilling apparatus, with steam-power, is in position, and the well has been sunk about 100 feet.

NEW YORK CITY.—The Sub-Committee of the Board of Street-Opening has under consideration the opening of Elm Street to Lafayette Place. At the meeting last week, General John Newton, Commissioner of Public Works, and member of the board, was directed to have plans prepared of the proposed thoroughfare.

PORT HURON, MICH.—Proposals will probably be made in a few months for a new pumping-engine for the water-works, as the one now in use is too small.

NEWARK, N. J.—The Sewer Committee of Common Council has adopted the plans submitted by Architect R. H. Rowden, for the pumping station of the intercepting sewers. The estimated cost of the building was \$7,383. Contracts were awarded as follows: Carpenter work to Josiah Freeman, for \$1,836; mason work, to Riker & Poole, for \$3,998, and the iron-work for roofing and girders to the Globe Manufacturing Company, for \$1,542. The new building will be started at once.

LEVEES.—About 500,000 cubic yards of levee work is to be done in the Yazoo, Miss., Delta District. Proposals will be let this month. T. G. Dabney, of Memphis, Tenn., Chief Engineer, will give information.

ANSONIA, CONN.—Bids for constructing the outfall sewer will be received at the Warden's Office until next Monday, September 20. The engineer's estimate is as follows: 1,470 lineal feet of 45-inch circular, double-course brick sewer; 245 lineal feet of 54-inch circular, double-course brick sewer; one 40-inch branch; one 30-inch branch; 8 manholes on 45-inch sewer; 10 bevel pipes 8-inch diameter; 60 bevel pipes 6-inch diameter; 4 bevel pipes 10-inch diameter.

HOLDEN, MO., is discussing a \$40,000 system of water-works. Plans are being prepared by George W. Pearsons, of Kansas City, Mo.

MILWAUKEE RIVER.—The City Engineer thinks that the plan of having the intercepting sewers will prevail, but may be supplemented by the tunnel and flushing plan. The proposed tunnel from the lake would be for the Milwaukee River only, as the Jones's Island Pumping Works are pumping 500,000 gallons of filthy water out of the intercepting sewer on the south side every week, using forty-five tons of coal, thereby practically flushing the Menomonee River.

The County Board has awarded the contract for building an iron bridge over the Milwaukee River at Humboldt to Keepers & Riddell, the Milwaukee Bridge and Iron Works,

for \$10,000, the work to be completed January 1, 1887.

City Engineer Benzenberg is getting ready to make borings for locating the new intake at Whitefish Bay. The pipe will be carried out three times as far as the present one, which extends only 2,100 feet. It will be three miles north of the old one, and there will be little possibility of receiving the impurities from the river, as is the case with the present one. The cost of the new intake is estimated at \$500,000.

TAUNTON, MASS.—The contract for building an iron bridge across Three-Mile River at Tremont Street, has been awarded to the Penn Bridge Company, of Beaver Falls, Pa., at \$1,755.

CHICAGO, ILL.—The Committee on Buildings recommends the acceptance of the bid of E. R. Brainerd & Co., to repair the county court-house, at \$45,000.

POUGHKEEPSIE, N. Y.—Bids were opened last week by the Board of Managers of the Hudson River State Hospital to be built at this place, and were found to be so much in excess of the amount authorized to be expended, that they were all rejected. New proposals will be issued. Plans are by Frederick C. Withers, of New York City. The Building Committee are Jacob B. Carpenter, Chairman; Charles H. Stott, Jr., John I. Platt, James Roosevelt. The bids received last week were as follows: Charles H. Brome, New York, \$194,850; Holmes Brothers, New York, \$185,000; Richard Deers, New York, \$179,970; Horace Clark, Poughkeepsie, \$178,978; John R. Kimlen, Poughkeepsie, \$159,930; C. L. Cannon, Poughkeepsie, \$159,380; Willet Titus, Poughkeepsie, \$155,210; Elias Spross, Poughkeepsie, \$151,786; O'Reilly & Powers, Poughkeepsie, \$144,640; Rafferty, McCallister & Co., Syracuse, \$158,959; Leary & Crawford, Syracuse, \$157,139; George C. Lawson, New Hamburg, \$163,000. The law limits the cost to \$125,000.

GOVERNMENT WORK.

LIST of bids received and opened September 4, 1886, by Supervising Engineer and Architect of new Pension Building, for setting beams, building arches, and brick partitions, concreting and laying fire-proof floor for fourth story of new Pension Building:

Remarks.	Material and Labor for Floor.	Beams, Brick-work, and Floor.	Beams and Brick-work.	BIDDERS.
Schillinger Pat. Portland Cement.	1.05 sq. yard.	\$5,955	Aug. Davis, Washington, D. C.	
" " "	98 cts. sq. yard.	5,480	Dobson & Bright, Washington, D. C.	
" " "	94 cts. sq. yard.	14,595	George D. Carr, " "	
" " "	\$3,307	9,787	Charles A. Appel, " "	
" " "	\$8,900	4,778	Justin McCarthy, " "	
" " "	\$2.55 sq. yard.	.....	Hurdle & Moore, " "	
" " "	\$2.16 sq. yard.	.....	George Drew, " "	
" " "	18 cts. sq. foot.	.....	H. L. Cranford, New York	
" " "	25 cts. sq. foot.	.....	E. H. Wootton, " "	
" " "	.....	.....	Schillinger Art. Stone Co., Washington, D. C.	

Work awarded to Charles A. Appel and George Drew.

LIST of proposals received and opened September 6, 1886, by the Supervising Engineer and Architect, for the fire-proof building for Pension Office in Washington, D. C., for "plastering on the new Pension Building," as per specifications of August 14:

BIDDERS.	For the Ornamental Work.	For Plastering, Square Yard.	For all Work Specified.
James Hughes, Washington D. C.	\$5,174.00
James Smith, Cleveland, O.
Collena Bros., New York	23,900.00
James Stichel, Washington, D. C.	17,217.87
John Keller, " "	17,600.35
J. Jouveval, " "
To finish and put up plaster cast-ings for \$1,200.

Award made to Mr. James Hughes.

" LIST of proposals received and opened September 6, 1886, by the Supervising Engineer and Architect of the new Pension Building for furnishing iron wall-bearing plates, as per advertisement dated August 25:

BIDDERS.	Per pound.	For all.	Each.
John Leatherland, Alexandria, Va.	1 3/4	.....	.....
Van Doren Iron-Works, Cleveland	.....	\$199.00	.....
E. N. Gray & Co., Washington, D. C.	1.84	.....	.....
King Iron Bridge Co., Cleveland, O.	.....	356.00	.....
Millikin, Smith & Co., New York	2.35	.....	.....
Thompson, Ashbruner & Co., Baltimore, Md.	2 1/2	.....	.....
George C. Howard, Philadelphia, Pa.	2	.....	.....
Manly & Cooper Manufacturing Co., Philadelphia, Pa.	.....	324.00	.....
C. A. Schneider Sons, Washington, D. C.	.....	208.80	.....
James H. McGill, Washington, D. C.	.....	169.00	.....
William J. Moore, Alexandria, Va.	.....	217.50	75c.
John Fitz, Martinsburg, Va.	2 1/2	.....	.....
Edward Snowden, Washington, D. C.	.....	.....	90c.
White's Sons, Washington, D. C.	.....	243.00	.....

Awarded to Mr. James H. McGill.

BALTIMORE, MD.—Abstract of proposals for dredging harbor at Baltimore, opened by Col. W. P. Craighill, U. S. Engineers, September 7: P. Sanford Ross, Jersey City, N. J., 17.4c. per cubic yard; Morris & Cumings Dredging Company, New York, N. Y., 17.1c.; George C. Fobes & Co., Baltimore, Md., 18c.; American Dredging Company, Philadelphia, Pa., 17 1/2c.; National Dredging Company, Wilmington, Del., 18 1/2c.; Baltimore Dredging Company, Baltimore, Md., 17.7c. All rejected; too high. Readvertised, and proposals will be opened September 16.

PERSONAL.

COLONEL CHARLES S. STEWART, Senior Colonel of Engineers, U. S. A., has applied to be placed on the retired list after to-day, for forty years of service. On April 11, 1887, he would be retired for age.

THE COMMISSIONER OF PUBLIC WORKS of this city has appointed Mr. E. E. Coryell engineer to superintend the paving of Fifth Avenue, in place of Mr. J. McEntyre Smith. Mr. Coryell is appointed for the reason that he recently investigated the manner in which the pavement was being laid, when the charges of its improper construction were brought, and his investigation made him specially familiar with the work.

In the new aqueduct the presidency of the construction committee was last week given to Commissioner Barnes. Previously, Mr. James C. Spencer was the chairman, but it was desired to have a practical civil engineer in the position.

Association News.

STATIONARY ENGINEERS.—The fifth biennial convention of the National Association of Stationary Engineers was held in Boston at the Quincy House, September 7, 8, and 9. There were 125 delegates present when President R. J. Kilpatrick, of St. Louis, called the meeting to order. The other officers of the association are: N. W. Williams, Philadelphia, Vice-President; G. M. Barker, Nashville, Treasurer; G. G. Minor, Cincinnati, Secretary. Immediately after coming to order the roll was called and the credentials were received by the secretary, after which they were referred to the following Committee on Credentials appointed by the chair: Messrs. Bailey of Nebraska, Venable of New Hampshire, and Ward of Massachusetts. Pending the report of the Committee on Credentials, the president read his annual address. Secretary Minor then presented his report, from which the following figures are gleaned: Number of new associations added during the past year, 28; total number of associations now on the list, 120; from the total are to be taken Rome and Brooklyn, N. Y., St. Paul, Minn., and Leadville, Col., lapsed, which have made no reports, and can therefore be dropped from the rolls, making 116 live associations; number of active members at the last meeting of the association, 2,926; honorary members, 361; number of members initiated during the past year, 1,372; total membership, 4,298; loss by suspension, 297; expulsion, 64; death 11; total loss, 372; present active membership, 3,926; honorary members added during the year, 289; total honorary membership, 648; lectures delivered during the past year, 273; books added to libraries, 1,410; expenditures for the relief of sick, disabled, or unfortunate members, \$1,785; receipts from per capita tax, \$633.18; from charter fees, \$560; sale of supplies, \$227.08; balance from last year, \$180.09; total, \$1,600.35; paid for salaries, \$730; office, \$324; organizing expenses, \$145. The chair then appointed the following committees: Constitution, James G. Beckerley, of Illinois, Frank Foster, of Connecticut, E. D. Bateman, of Ohio; Auditing and Finance, F. R. Low, of Massachusetts, J. R. Smith, of Washington, D. C., E. C. Dicey, of Wisconsin, R. O. Smith, of New York; Mutual Aid, Barker of Tennessee, Burlingham of Rhode Island, Moseley of New York, Yale of Connecticut, Fox of Illinois, Monroe of Massachusetts, Eaton of New Hampshire; Appeals and Grievances, Ambler of Missouri, Walbridge of Illinois, White of Ohio; Good Order, Henderson of New Jersey, Clark of New York, Russell of Pennsylvania; Ways and Means, Creighton of Kentucky, Pollack of Ohio, Deluse of Kansas; Ritual, Holt, of Connecticut, Smith, of the District of Columbia, McMillan, of Wisconsin. Treasurer G. M. Barker presented the following report: Balance sheet, June 30, 1886.—Amount brought forward from 1885, \$180.09; received from 19 charters, \$330; per capita tax and supplies, \$409.85; life members, \$4. Expenditures—By amount paid on orders, \$897.70; cash on deposit, \$26.24. The Committee on Credentials reported further, sustaining the action of the Board of Arbitration suspending Rochester Association No. 3, of New York, and recommending that the question be brought before the convention for final settlement, and finding that Brother Vanderpoel was the authorized delegate from Canton, O. A long debate arose as to whether Mr. Tinkham or Mr. Walker should be recognized as the delegate from the Brockton association, and a motion to admit the former prevailed. The following resolutions, offered by Simmons, of Illinois, were referred to the appropriate committees: That the Board of Arbitration be not members of the National Association; that all delegates may become life members without the payment of any fee; that the secretary be authorized to design a badge to be worn by members. In the evening the annual banquet took place. A reception was given to the visiting engineers and their guests and lady friends by Massachusetts Association No. 1, of Boston, at the Quincy House parlors. On September 8 the convention visited Lawrence, to inspect the mills. On Friday, the annual election took place, with the subjoined result: President, Frank A. Foster, of New Haven, Conn.; Vice-President, R. O. Smith, of New York City; Treasurer, G. M. Barker, of Nashville, Tenn.; Secretary, G. G. Minor, of Cincinnati, O.; Conductors, M. M. Walbridge, of Chicago, Ill.; Door-keeper, H. Knowlton, of Detroit, Mich. The convention then adjourned.



THE SANITARY ENGINEER.

DEVOTED TO

ENGINEERING, ARCHITECTURE, CONSTRUCTION, SANITATION.

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THE CHARLESTON EARTHQUAKE.

THE last meeting of the American Society of Civil Engineers was the occasion of an interesting account of scenes and incidents during the recent earthquake at Charleston, by a Mr. Duke, a civil engineer, of that city. In answer to questions he gave the result of personal experiences and observations at the time. He corroborates the statement made, that but slight injuries were received by persons who remained in their dwellings. One person in a balcony was killed by a falling chimney, but the main portion of the accidents was to persons in the streets.

The shocks were first horizontal, then vertical, and rotatory. In the cemeteries shafts were found twisted around on their pedestals; chimneys also were in some cases turned partly around on a vertical axis. A great amount of damage and much of the danger arose from the falling of chimneys, these being broken off in all cases just above the roof of the buildings to which they were attached. The greatest horizontal movement seemed to be in a direction approaching north and south. He had seen a crack about ten inches wide in a street from which water had been thrown. The sides of the crack were covered with a different colored sand from that of the surface.

He understood that a much wider crack existed between there and Summerville, but had not seen it. At one point a line of rails on one of the roads was depressed eight feet. A warm spring had appeared in the yard of a house where none existed before. He described his personal experiences, of his bed jumping about on the floor, mantel ornaments, plaster from the walls, etc., falling, and at last the chimney-top tumbling into the fire-place and filling the room with soot and dust. All animals and feathered fowl gave evidence of their fright by their peculiar cries, and the horses attached to the fire-engines were unable to draw them, seeming to be overcome by fear. Mr. Duke estimates that about ten per cent. of the wooden buildings and twenty per cent. of the brick buildings will have to be rebuilt, and that there is not a building but what requires more or less repairing. No serious breaks have been discovered in the gas or water mains, the street-lights not being extinguished.

THE NEW SCHEDULE OF CHARGES ADOPTED BY THE MILWAUKEE ASSOCIATION OF ARCHITECTS.

THE schedule of charges recently adopted by the Milwaukee Association of Architects, which we elsewhere print, is noticeable for its deviation in several important particulars from the schedule of the Western Association of Architects, the American Institute of Architects, and indeed all other official schedules with which we are acquainted, either in this country or in England.

So far there has been a perfect consistency in the rules of professional practice adopted by all architectural associations; the official schedules of charges being practically identical all over the

country. This uniformity of practice, based as it is on long usage and experience, both here and abroad, has been an important aid in enabling architects to secure adequate remuneration for their services and a proper recognition of the standing of the profession, and that the Milwaukee association in adopting a schedule should not have followed the general practice is greatly to be regretted. The charge for full professional services for dwelling-houses according to the Milwaukee schedule is the usual five per cent.; but this is divided so as to make the charge for drawings, details, and specifications three per cent. and superintendence two per cent., instead of three and a half per cent. for drawings and specifications and one and a half per cent. for superintendence. A more important and more unjustifiable deviation is that for churches and public buildings costing over \$15,000 the charge for full services is only four and a half per cent., for flats and office buildings four per cent., and for warehouses and plain stores three per cent. We cannot but think that there are but two results which can follow from this: Either the buildings of Milwaukee will not receive the care and study which conscientious architects should give their work, or the Milwaukee architects will make but a scanty living.

THE HELL GATE IMPROVEMENT.

THE practical results of the explosion at Flood Rock, a full illustrated account of which appeared in THE SANITARY ENGINEER of December 4 last, are now being made manifest. A letter from Col. Walter McFarland, U. S. Engineer Corps, who succeeded Gen. John Newton in the charge of the Hell Gate improvements, to the Pilot Commissioners of this port shows that since the explosion took place last October an 18-foot channel has been opened between Flood Rock and the Mill Rocks. There has been an entire removal of the "Negro Heads" to a depth of eighteen feet below mean low water, and by the partial removal of the Hen and Chickens to the same depth. This new 18-foot channel is about 350 feet wide at its upper end and widens to a little above 400 feet abreast of Little Mill Rock where the Negro Heads used to be. The 12-foot channel between these rocks is 150 feet wider than the 18-foot channel, its total width being about 500 feet, the additional width being gained on the west side toward the Mill Rocks.

The Lighthouse Establishment has been asked to buoy this channel so that it may become of immediate use to navigators. The new appropriation recently made for the improvement of Hell Gate will be applied toward widening this channel on its eastern side and to deepening it to twenty-six feet at mean low water, and it is expected that subsequent appropriations will be applied in the same way until the whole of the middle reef, comprising Flood Rock, Negro Head, Hen and Chickens, and Gridiron, is removed and a low-water channel twenty-six feet deep is secured from the Mill Rocks to Hallet's Point.

"THE DANGER OF SANITARY PLUMBING!!"

WHAT is sanitary plumbing? Probably the majority of the readers of THE SANITARY ENGINEER have more or less well-defined notions as to the proper answer to this question, the shortest being that it is plumbing-work so planned and constructed that with proper care it will produce no danger to health. But when the usually conservative and carefully edited New York *Evening Post* publishes, under the sensational title given above, a letter, signed "Architect," based on fallacies long ago exploded, it seems worth while to repeat a little elementary information on this subject. "Architect" commences with the assertion that—

'All practical plumbers advise and are ready to execute in the most intricate and expensive manner the introduction of the insidious deadly poison of sewer-gas into the bedrooms or the adjoining closets of every man's house.'

What the contents of the skull of the author of such a deliberate, well-rounded falsehood as that sentence comprises will probably be hereafter, if not already, a mat-

arately trapped, but the five open marble basins and bath in and adjoining the five bedrooms were all without traps and with no direct or indirect ventilation. The waste-pipes from five basins and one bath when gathered together in one passed into a 6-inch iron soil-pipe in the cellar, and here, at an average distance of sixty feet from basins and bath, was a single unventilated pint-of-water trap, which was probably syphoned every hour of the day. Sewer-gas permeated the bedrooms, and when completely closed for twenty-four hours they were filled with a sickening odor."

The ideas of "Architect" as to what constitutes an "expert" are evidently peculiar. Such a piece of work as that which he describes is, as he ought to know, contrary to law, and if done within the last five years would render the man who did the work and the inspector who passed it liable to punishment. His quoting this example as if it were the usual kind of work done in New York by plumbers and approved by inspectors is little short of calumnious.

It does not appear to us that the false statements and misrepresentations made in this letter should be charged to ignorance so much as to the deliberate intention to create a scare without regard to truth. The

OUR BRITISH CORRESPONDENCE.

The Sunderland Local Authority's Method of Obtaining School Plans—A Tell-Tale Paint—Death of Dr. Wakley—Healthy London.

LONDON, September 4, 1886.

THE Local Authority of Sunderland is desirous of erecting School Board schools, but at the same time is very economically disposed. The matter is to be one for competition. The board's circular giving conditions of competition offers the munificent premium of £50, £20, and £10 (\$240, \$96, and \$48) for the three first designs in order of merit. The board announces that the design receiving the magnificent recognition of £50 is to become the property of the School Board, to be used by them or not, as they shall decide. They do not pledge themselves to employ the author to superintend the building, should it be constructed on his design; the payment of the premium is to be the *quid pro quo* for the drawings. As the amount proposed to be spent on the schools is £7,000, and the arch



A ROW OF DWELLING-HOUSES AT WASHINGTON, D. C.—W. B. GRAY, ARCHITECT.

ter of some interest to his physician. Next he tells us that—

"Professional medical experts have said that water in a waste-pipe trap changed every two hours will not permit the passage of sewer-gas. If this is true, then one's little children put to bed at 8 P. M. in a bedroom handsomely fitted with hot and cold water, silver faucets, and decorated porcelain, will commence at ten o'clock to breathe the foul gases generated by sewer filth, and continue to do so for the next eight hours."

The connection between the premise and the conclusion is not apparent. But, as a matter of fact, professional experts have shown that a properly ventilated water-trap protects against sewer-gases, and, especially, against disease germs, for at least thirty-six hours without being changed. "Architect" says that he has—

"Lately overhauled a fine house on the west side, said to have been the best plumbed house in New York, done by experts and approved by another who chalked his name on the ventilating-pipe. The lead was heavy, the joints beautifully wiped, the silver faucets and marble basins all that could be wished for, and where the pipes were too long they were coiled around under the floor and thus increased the plumber's bill. The kitchen-sink and the wash-tubs were sep-

only sensible thing in the letter is the conclusion that a house should have no more plumbing in it than is necessary. How much is necessary in each case depends on the plan of the house and the tastes and habits of the inhabitants. If, instead of sneering at plumbers, experts, and sanitary plumbing, the press would try to have the people instructed as to the differences between good and bad work, between true and false experts, and between sanitary plumbing and such conceptions of it as "Architect" would urge on the public, it would do a great deal of good and get rid of a good deal of nonsense.

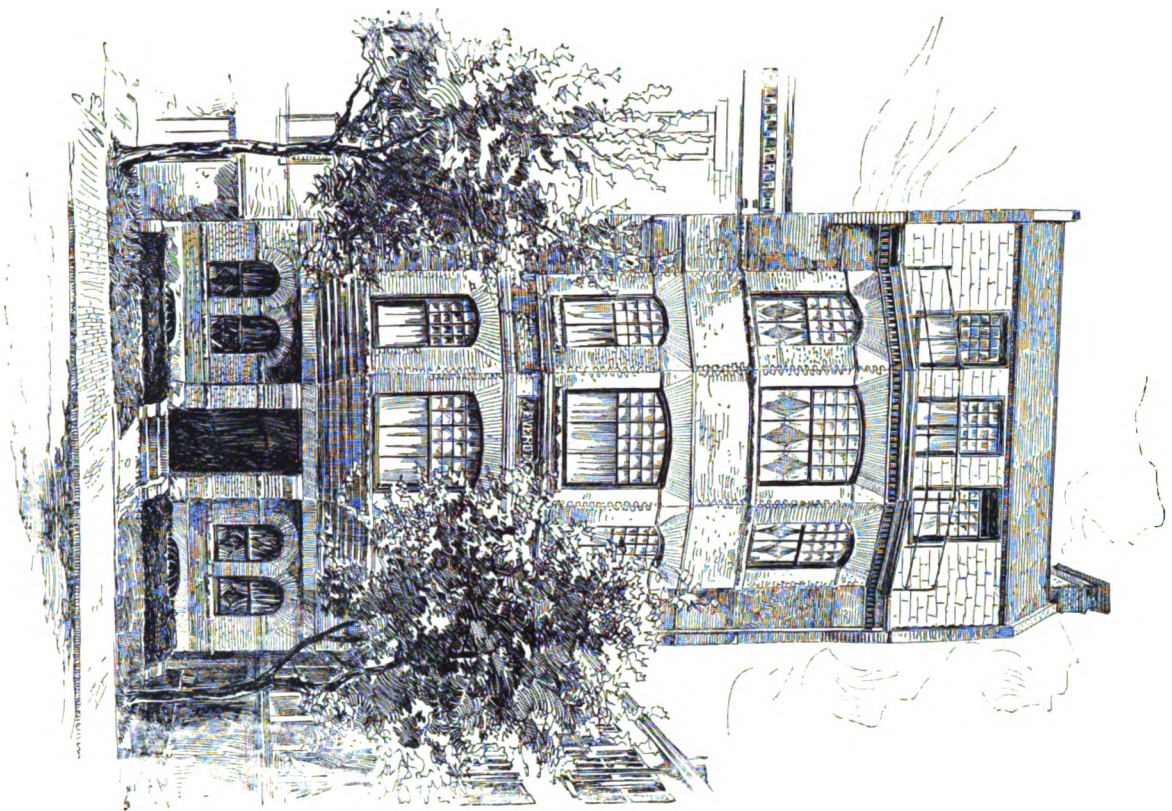
AMERICAN PUBLIC HEALTH ASSOCIATION.

THE local Committee of Arrangements of the American Public Health Association meeting in Toronto has made arrangements for reduced fares. Certificates entitling the holder to the reduction may be obtained by addressing Dr. I. S. Covernton, Chairman of the Transportation Committee. The first session will be held on October 5. See our issue of September 9.

test's fee at 2½ per cent. would be £175 (\$840), the board is not likely to get very many architects of standing to compete. As members of an incorporate body, the architects should make regulations to deal with such cases, pledging themselves not to submit plans in competition unless they are either (1) to superintend the erection of the building and receive their proper remuneration for so doing, or (2) to receive such a sum in the shape of premium as would be the equivalent of a fair premium plus the professional fee, as though the winner of the competition had acted as supervisor.

A novelty in the shape of a tell-tale paint, has been put upon the market by Mr. Henry Crookes, of Westminster Chambers, Victoria Street, London. If the bearings of an engine are covered with this paint, the abnormal color of which is a brilliant red, and such bearings run hot, the paint will darken in color, until at 180° Fah. it is quite brown. As the paint cools it recovers its original color.

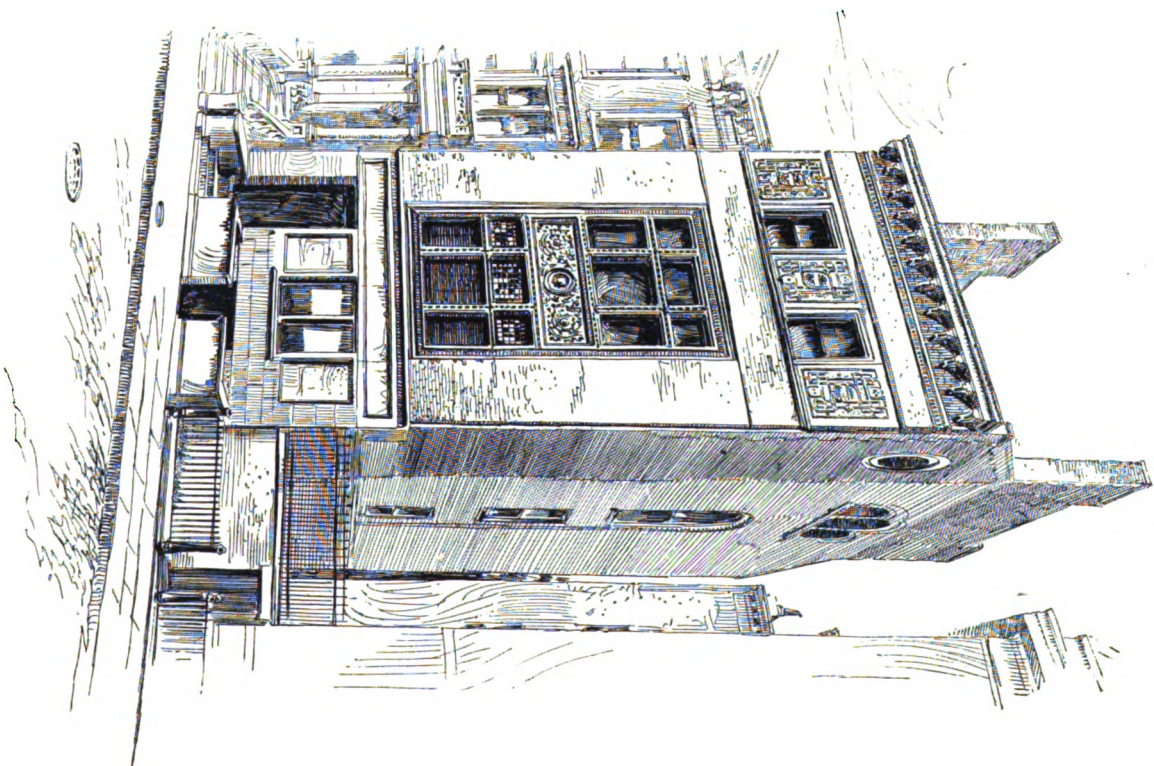
Dr. James Wakley, editor of the *Lancet*, died on Monday, 30th ult. He succeeded his father, Mr. Thomas



A BACHELOR APARTMENT HOUSE, WASHINGTON, D. C.

HORNBLLOWER & MARSHALL, ARCHITECTS.

THE SANITARY ENGINEER ILLUSTRATED SERIES.



A NEW YORK RESIDENCE.

MCKIM, MEAD & WHITE, ARCHITECTS.

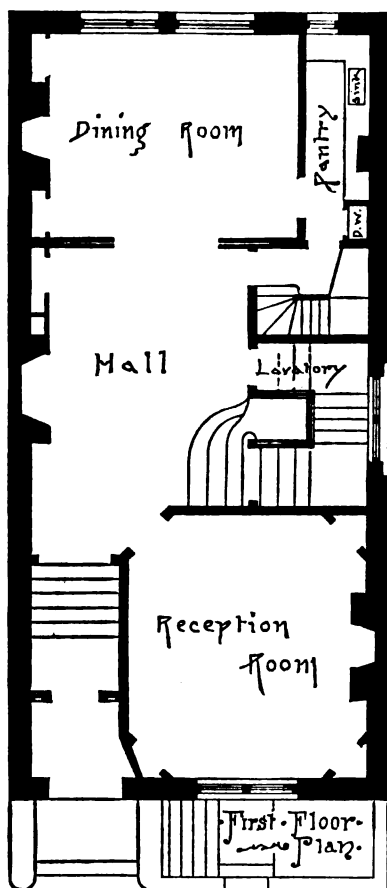
Wakley, the founder of the journal, at the death of the latter in 1862. Dr. Wakley has suffered from cancer in the tongue for the past three years, but his friends had no intimation or expectation of sudden decease. Apart from the editorship of the *Lancet*, Dr. Wakley was known as one of the founders of the Hospital Sunday in London, when the special collections in the places of worship are devoted to the London Hospitals and Dispensaries.

Instancing the healthy state of London at present, it was announced at the last meeting of the Metropolitan Asylums Board that the board had not a single small-pox patient in any of its hospitals. SAFETY-VALVE.

OUR SPECIAL ILLUSTRATION.

A RESIDENCE IN NEW YORK CITY.—MCKIM, MEAD & WHITE, ARCHITECTS.

THE New York building shown in our Special Illustration of this week is the residence of Lloyd Phoenix, Esq., Thirty-third Street, near Madison Avenue, New York. The first



story front is of Scotch red sandstone, above the first story special brick and terra-cotta. The architects were McKim, Mead & White, of New York.

OUR ILLUSTRATION OF A MODERATE-COST HOUSE.

SMALL HOUSES AT WASHINGTON, D. C.—WILLIAM BRUCE GRAY, ARCHITECT.

THESE houses are situated on Nineteenth Street, near Dupont Circle. The lower portions are built of brick, the upper stories of frame. On the first floor of each are a parlor, library, and dining-room, and butler's pantry; on the second floor there are three chambers and a bath-room. The attic contains two rooms. In the basement are the kitchen and laundry. There is a cellar under the terrace. The inside finish is in poplar; mantles are of wood. The cost was about \$4,500 each. The architect was Mr. William Bruce Gray, of Washington, D. C.

THE ALLEGED BREAK IN PROSPECT PARK RESERVOIR, BROOKLYN.

IN our reference to the alleged break in the Prospect Park Reservoir, Brooklyn, we were in error in naming the late Mr. Moses Lane as the engineer who constructed it. The chief engineer at the time was James P. Kirkwood. The assistant in charge of this particular piece of work was Mr. Theodore Weston, now of this city, Mr. Lane being at that time principal assistant to Mr. Kirkwood.

PAVEMENTS AND STREET RAILROADS.

No. II.

(Continued from page 370.)

FOOTPATHS OR SIDEWALKS.

WE interrupt our description of the pavements of Liverpool to notice a paper entitled "Footpaths" (sidewalks), by H. Percy Boulnois, M. Inst. C. E., Borough Engineer of Portsmouth, which is of interest in connection with this series.

The paper first remarks on the proportion between the widths of footways and carriageways adopted by the Local Government Board. The requirement is that every new street shall have a carriageway at least twenty-four feet wide, with a footpath each side "of a width not less than one-sixth of the width of such street" (meaning, as is explained, one-sixth of the width of the carriageway). The width of roadway should be, if possible, some multiple of eight feet, "since this is the allowance of vehicles passing each other at a rapid rate."

The gutters at each side to be not less than three inches deep or more than seven inches. Curbs to be set on "clean sharp ballast," and well rammed.

The materials used for footpaths may be classified as: (1) Natural stones; (2) Natural asphalts; (3) Artificial asphalts and concretes; (4) Brick; (5) Gravel and stone chippings.

The requirements of a good covering for sidewalk are that it shall not be slippery and shall not scale or flake. It must be durable, not easily abraded, strong, of uniform quality, dry rapidly after rain, and dust should not readily adhere to it. Its absorbent powers should be tested. Its quality will also be in a measure indicated by its microscopic appearance and specific gravity. Its wearing qualities may be tested by rubbing and drilling, but better by actual test under a known traffic.

Of natural stones granite is durable, but wears very slippery, is difficult to work, and is expensive.

Yorkshire flags are much more largely used. They are readily cut, do not wear smooth, and are never slippery from wear. They are more liable to breakage, absorb considerable moisture, and tend to laminate when exposed to frost. (The same is true of many of our American flag-stones.) The wear under heavy traffic in the city of London was about one-sixteenth of an inch per year, and this is given as the rate in the Strand for every 9,000,000 foot-passengers.

Slate wears very slippery; most of the freestones are too soft; and some of the limestones are very brittle and wear slippery.

Of natural asphalts, that is recommended which contains about seven per cent. of bitumen, and, where possible, that it should not be laid except by the compressed method. The "mastic" (which contains more bitumen) is considered only "suitable for broad paths with light traffic." The former should not be laid of less than 1-inch thickness, and the latter of $\frac{1}{2}$ -inch; it being essential that a foundation of cement concrete three inches thick be first provided, "as asphalt is like a mineral leather or elastic skin, and has no strength in itself, but acts solely as a cover to the concrete," which actually carries the traffic. "It is almost impervious to moisture, and is the best pavement that can be used from a sanitary point of view." In Birmingham it requires relaying every five or six years, and compressed asphalt paths have lasted ten years in some of the busiest thoroughfares in London. In Leicester, mastic paths (uncompressed) have lasted fifteen years. Under considerable traffic it is estimated by the author that compressed asphalt one inch thick will last twelve years.

Of artificial pitch mastics the composition of one of the first used is given as fifty parts waste products of tar-oil, twenty of caustic lime, 200 of pitch, thirty of sawdust, and 700 of iron slag, grit, or chalk; the materials being simply mixed, spread in layers, and rolled. Another laid in 1840 was Stockholm tar three parts, chalk two parts, and sand one part, boiled together and spread hot.

One of the best modern mixtures is of gravel or stone chippings screened to the several sizes, passing through sieves of $1\frac{1}{4}$ -inch, $\frac{3}{4}$ -inch, $\frac{1}{2}$ -inch, and $\frac{1}{4}$ -inch mesh, and heated on iron plates; when dried and thoroughly heated, the following mixture was made and well-boiled: twelve gallons of tar, fifty-six pounds of pitch, and two gallons of creosote, this quantity, while still hot, being added to about a ton of the hot screened materials. A thin layer of the largest material is laid first and rolled by a $\frac{1}{2}$ -ton roller, and the others similarly in succession, the finest on top. The chippings make the best pavement.

The foundation must be dry, and the pavement is best laid "in the spring or winter, if dry, as a hot sun draws the composition away from the stone on to the surface of the path." The surface should be dusted over with fine grit or stone-dust, "and this facing, accompanied by a thin 'painting' with tar, should be repeated at least every other year."

The life of these pavements is given variously at from five to twenty years. The disadvantages named are its dark color, its wearing gritty and bumpy, and its "rather difficult repair." In very hot weather it becomes sticky or soft. "Tar pavement must only be reckoned as a substitute for ordinary graveled footpaths. It must not be compared with paved or asphalted paths." It is largely used for suburban footpaths.

Monolithic pavements of Portland cement concrete are gaining in favor, "and may be looked upon as the pavement of the future," and these when properly laid, with joints at about six feet intervals, are found to be very durable. Shingle or gravel does not work so well as crushed granite, since the former is apt to become dislodged or else protrude and make a rough surface. A bottom layer, $2\frac{1}{2}$ inches thick, of one part Portland cement to six parts shingle or stone, with a $\frac{1}{2}$ -inch layer on top of one part cement to two parts finely broken and well-washed granite, are recommended. Great cleanliness and care in mixing are needed, with thorough ramming of the concrete and troweling of the surface. Traffic should be kept off until it is thoroughly set by a covering with boards for a fortnight, and afterward by a covering of wet sand. This description of pavement is rather slippery and should have a light cross-fall. It may be molded in blocks and laid in this form if desirable. After the upper surface is worn these can be turned and will present a fresh wearing-surface.

Brick pavements are undesirable on account of the multiplicity of joints and their consequent insanitary character, their harshness to the foot, and the necessity for a concrete foundation to keep them level. Special vitrified bricks have a life under heavy traffic of thirty years and upward. Gravel and similar materials are only desirable for cheapness.

In conclusion the author states that "asphalt has suffered in repute because inferior materials have been used under that name. Tar pavement is an excellent substitute for gravel paths, and is a good pavement for light traffic. Concrete, monolithic, and flagged pavements are every day gaining in favor and have much to recommend them."

We wish to remark, by way of comment on the proportion between width of roadway and sidewalk given in the paper, that, while it might be an advisable one in streets almost entirely devoted to wheel traffic, it should not be adopted in other localities. In towns of moderate dimensions where shade-trees are planted the most pleasing results will be obtained with the walks nearly or quite one-half the width of the roadway, and even in busy streets it will be found that about one-third, exclusive of stoops or other projections, is not too great a width for the sidewalks.

With the necessity in this latitude for providing for heavy snows the depth of gutter mentioned is too small. The general rule holds good that the better the surface of a roadway the less crown is required to carry water to the gutters. The experience of the present writer on streets with a graveled surface where the longitudinal fall obtainable was from 0.1 of a foot to 0.2 of a foot per 100 feet was that a crown of eighteen inches on a roadway forty feet wide, reducing to one foot on one twenty feet wide, on newly made streets, was not objectionable in use and became rapidly less from wear. On the contrary, crowns of about six inches are quite sufficient on well-paved streets which are kept clean and in good surface.

It is a very common fault to give too steep a cross-slope to flag and other footpaths. The sole object of this slope is to carry water to the gutter. Since the surface is required by municipal ordinances to be kept clean from snow, there is sure to be at times a thin coating of ice formed upon it, and under such circumstances a cross-slope of $\frac{1}{2}$ -inch per foot becomes dangerous to passengers. It will be found in practice that $\frac{1}{4}$ -inch per foot will give the most satisfactory results. In comparing practice in our cities with that abroad it should be borne in mind that much greater care is usually exercised there to obtain accuracy of alignment and smoothness and perfection of surface; also, that much greater attention is paid to keeping the surface in repair. We may well take a lesson from them in this important matter.

(TO BE CONTINUED.)

SEWAGE DISPOSAL AT PROVIDENCE, R. I.

IN response to requests from the City Council of Providence for detailed information regarding plans for disposal

of the city sewage, Mr. Samuel M. Gray, the City Engineer, has made a brief but full report in print. The lines to be followed by the intercepting-sewers are shown on maps, and the reason for their location explained to be that natural valley lines are most favorable for carrying off drainage, and intercepting-sewers are best located near the outlets of the sewers from which the flow is to be collected. When natural drainage lines must be departed from, the most direct line to the point aimed at is the best. These principles have been followed in the plans proposed, as is explained in some detail.

Regarding the reason for recommending works for precipitation of the sewage solids and discharge of the clarified liquid into tide-water, instead of disposing of it by irrigation or discharging it in a crude state into waters farther from the city, he says that he recommends the precipitation plan because it is the most practicable for the city, is the most economical, and is capable of being carried out so as to remove all fear of nuisance being caused by the works or the effluent from them.

Mr. Gray combats very forcibly the idea that profit can be made out of sewage, and argues from the experience of all the efforts that have been made in that direction, that Dr. Tidy was entirely correct when he said that "sewage is a great ugly thing that one has to spend money on to prevent its being a trouble and causing a nuisance," and that Baldwin Latham's statement that "it must be looked upon as a dead loss in whatever way you have to deal with it" is literally true.

To criticisms that the proposed plans provided for too great a population, and might also be reduced by not taking in manufacturing wastes, Mr. Gray replies that the total estimated cost as proposed would be, for 300,000 population, \$3,699,504. Adapting the works for 200,000 population would reduce this estimate only \$33,495, or less than one per cent.; or again, the exclusion of manufacturing wastes from the sewage to be treated would reduce the cost of the works only \$78,859, or a little over two per cent.

The plan proposed by Mr. Gray for disposal of the sewage is the same as that used at Coventry, England, where it has been in operation eleven years, and there is no complaint of any nuisance caused by the proximity of the works to houses of a good class, as is stated by Mr. J. C. Melliss, the engineer, who furnished Mr. Gray with a plan of those works, which is reproduced in the report.

Mr. Melliss also writes to Mr. Gray:

"Two years ago I put up and started precipitation works at Leyton, dealing with a population of 40,000 persons. You will see by the photograph I send you that the works are surrounded by houses at no great distance, and not only is there no complaint, but the Clerk to the Board of Health told me only this week that people pass by and do not even notice the works. I am now designing works for a portion of the Thames Valley—viz., Richmond, Kew, Mortlake, etc., etc., where there are parks and good houses in abundance. Then again, there are houses in close proximity to the precipitation works of Wimbledon, Birmingham, and especially at Chiswick, where the precipitation works, dealing with a population of 20,000 persons, are only 270 yards distant from the Park gate and lodge, and only 420 yards from the residence itself of 'Devonshire House,' the residence of the Duke of Devonshire, one of the most wealthy noblemen in this country. Further than this, the Duke himself sold the land for these works, and to show that his residence is not injured he has recently let it to the Marquis of Bute, another very wealthy man, who is now residing there. I am sure these facts ought to do a great deal to allay alarm in the minds of your citizens. * * *

"Although I am satisfied that if properly designed and managed there is no smell outside of the works themselves, I would, on sentimental grounds, not select to place precipitation works in a park if any other site were available. * * *

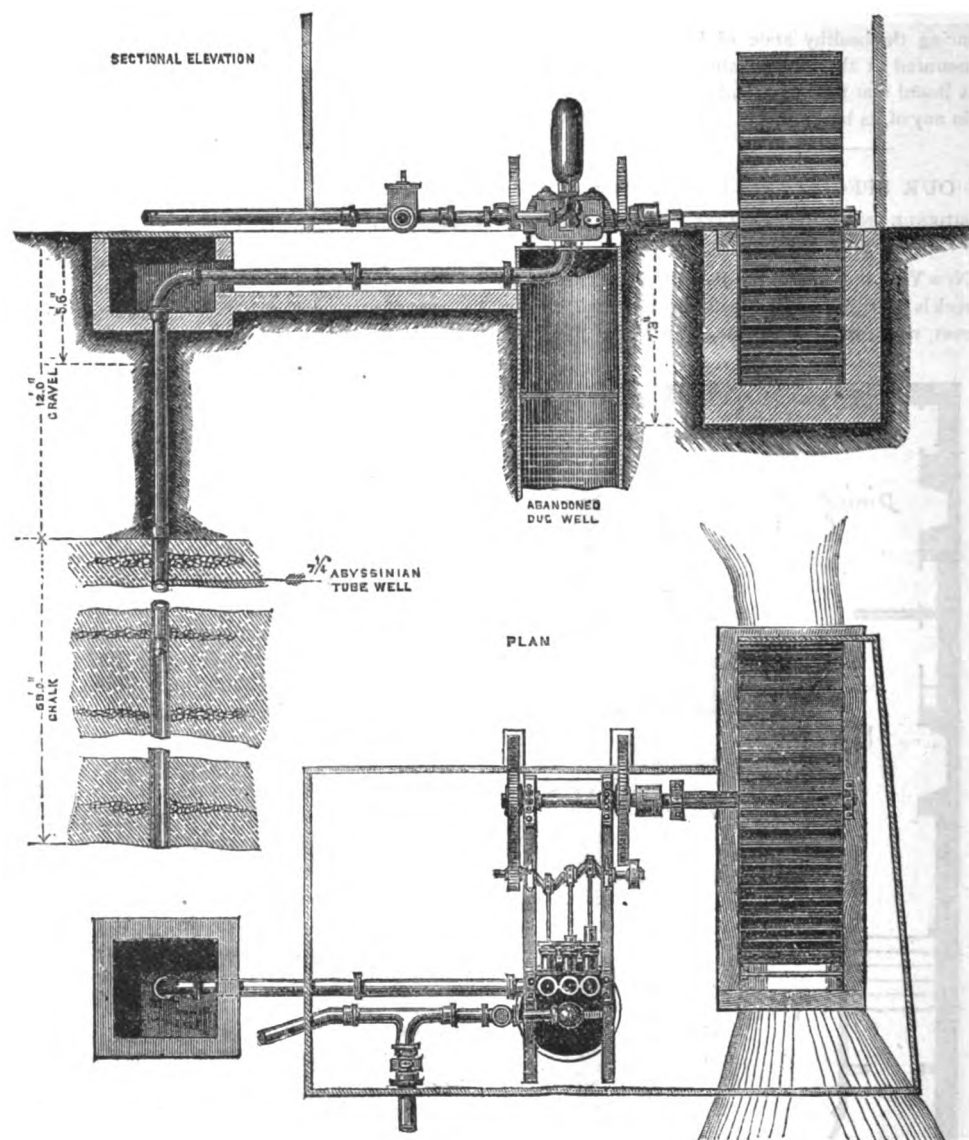
"Of this you may be quite confident, that persons residing at a distance of 2,000 feet from the works would not know that they were near to any works of the kind."

Mr. Gray also quotes certificates from a number of residents of Coventry, published in an advertising circular of the company which operates the works (the Rivers Purification Association), to the effect that no nuisance is caused.

In this process, the sewage is received in tanks where the sludge is precipitated by the admixture of sulphate of alumina, protosulphate of iron and lime, and the water then drawn off into the stream and the sludge or semi-fluid deposit pumped out, compressed by filter-presses into cakes, and carted away.

DRIVEN WELL AT HERTFORD, ENGLAND.

THERE are now seven towns in England, with an aggregate population of 85,000, supplied with water from driven wells. The latest of these is Hertford, with a population of 8,000, which has a well 81 feet deep driven through gravel, chalk, and flints. The water stands in the tube at



six feet below the surface, being thirteen inches above the ground-water level adjacent. The water is pumped 100 feet to a reservoir by a 3-throw pump driven by a water-wheel, as shown in the accompanying drawing taken from the *Engineer*. The pumps have $5\frac{1}{4}$ -inch barrels, with $8\frac{1}{2}$ -inch stroke, and make eighteen strokes per minute.

A MODERN SAFE-DEPOSIT VAULT.

THE problem to be solved in the planning and construction of the modern safe-deposit vault is the arranging and building of what may be called a chamber which shall contain a number of smaller chambers, for the storage of the portable wealth of individuals, and to which they shall have access and opportunity for inspection.

Entrance to this larger chamber, to those rightfully entitled to it, must be easy and simple; but to the attack of the elements, or the evil-disposed, it must be impervious.

It must be exposed to view upon the sides and top, and, if possible on the bottom, and so isolated from its surroundings as to admit of passage on all sides. Economy of space occupied must also be observed. At first sight such a problem appears comparatively easy of solution.

Solidly built stone or brick walls and a number of guards would appear to be factors in the answer, but as walls of sufficient thickness occupy much space, and the wages of many watchers materially increase operating expenses, the modern treasure-chamber has resolved itself into the steel box, with the services of one, or perhaps two watchmen.

One of the most recently constructed vaults of this kind, with the details of its manner of building, is herewith illustrated.

In connection with such a vault, public and private rooms for the convenience of those having deposits—for the inspection of securities, cutting of coupons, etc.—are

required, but as the arrangement of these depends upon conditions of site, and may vary in each case, a description of them is not included.

The vault shown in plan in Fig. 1 has an inside area of 29 feet 2 inches, by 31 feet 11 inches, and contains fourteen tiers of drawers and boxes, ranging in size from

3x5 inches to 30x40 inches, all being two feet deep. These boxes are of steel, and fitted with the Yale or combination lock as is desired. The most interesting part of the construction, and that in which the ingenuity and skill of the constructor is best shown, is the shell of the main vault and the construction of the doors, these latter being the points of weakness.

The vault itself is isolated from the surrounding walls, giving passage for the watchers, and stands upon a system of brick arches quite independent of the construction of the building.

A section of the shell of the vault is shown in Fig. 2.

This shell is made up of alternate layers or sheets of plate-iron and chrome steel and iron, the different plates being about 30 inches by 4 feet, breaking joints in all directions, and fastened together by steel screw-bolts as shown in the section. It is built from the outside in—the $\frac{3}{4}$ -inch plate being on the outside—and the bolts are so placed that no one bolt comes in line with another. That is, by drilling through from the outside, but one bolt could be found, and that only by chance, as none appear on the outside surface. The plates of chrome steel and iron are made by welding them in rollers, they being arranged as in the smaller section under Fig. 2, the hatched portion being the steel.

When finished the shell has a total thickness of $2\frac{3}{4}$ inches. The corners are made by bending the alternate plates at right angles, forming an interlocking joint. This is sometimes further strengthened by interior angle-irons.

The door (Fig. 3) is shown just before closing. It and its frame are made in the same way as the shell, but of extra thickness, to allow for the hinges and as a seat or striking-plate for the door.

It will be seen that the door and frame have corresponding projections and recesses fitting into each other with

perfect exactness. It would be impossible to accomplish this with absolute tightness with the ordinary form of hinge, as the arc upon which the door swings necessitates some beveling of the jambs, to allow the door to come to its seat. These doors, however, are fitted with a most ingenious form of hinge, by which, at the moment of closing, the door is brought into a plane parallel to that of its seat, and wedged into place, the alternate projections and recesses fitting each other with great precision.

It will be seen what little opportunity is allowed for the use of wedges in attempting to force such a door. Although the joint is almost air-tight, a further safeguard against the use of explosives in forcing the door is the grooving, the projections of the door and jamb, and fastening a rubber bed in the corresponding recess. When the door is wedged into place the joint is considered absolutely safe. The vault-doors may be fitted with either combination or time locks.

The ventilation of these vaults has, as a general thing, been by means of unsatisfactory and cumbersome appli-

SCHEDULE OF ARCHITECTS' CHARGES ADOPTED BY THE MILWAUKEE ASSO- CIATION OF ARCHITECTS.

THE Milwaukee Association of Architects, says the *Evening Wisconsin*, has adopted the following schedule of charges and rules of professional practice:

Complete drawings, specifications, etc., for dwellings, three per cent.; superintendence, two per cent.; for churches and public buildings, three per cent. for first \$15,000 and 2½ for all over that amount; superintendence, two per cent.; for flats, office buildings, etc., 2½ per cent.; superintendence, 1½ per cent.; for warehouses and plain stores (exclusive of fixtures), three per cent.; for drawings, specifications, and superintendence, for special designs for mantels and stationary furniture, and for elaborate interior finish requiring special designs, ten per cent. In case of the abandonment of the work the charge for partial service will be as follows for dwellings, and in the same proportion for other classes of work: Preliminary studies, one per cent.; preliminary studies, general drawings and specifications, two per cent.; preliminary drawings, general drawings, specifications and details, three per cent. For alterations

dered. The architect's payments are successively due as his work is completed in the order of the above classification. Until the actual estimate is received, the charges are based upon the estimated cost of the work, and the payments are received as installments of the entire fee, which is based upon the actual cost. The architect bases his professional charge upon the entire cost to the owner of the building when completed, including all the fixtures necessary to render it fit for occupation, to which he is called upon to give a general supervision. This includes arranging with artists, tradesmen, and others, for stained glass, heating-apparatus and works of a similar class, for which the architect does not furnish the designs, but to which he gives his supervision. The architect is entitled to additional compensation for furniture or other articles designed or purchased by him. If any material or work used in the construction of the building be already upon the ground or come into possession of the owner without expense to him, the value of said material or work is to be added to the sum actually expended upon the building before the architect's commission is computed.

Supervision of Works.—The supervision or superintendence of an architect (as distinguished from the continuous personal superintendence which may be secured by the employment of a clerk of the works) means such inspection by the architect or his deputy, of a building or other work in process of erection, completion, or alteration, as he finds necessary to ascertain whether it is being executed in conformity with his designs and specifications or directions, and to enable him to decide when the successive installments or payments provided for in the contract or agreement are due and payable. He is to determine in constructive emergencies, to order necessary changes and to define the true intent and meaning of the drawings and specifications, and he has authority to stop the progress of the work and order its removal when not in accordance with them.

Clerk of the Works.—On buildings where it is deemed necessary to employ a clerk of the works, the remuneration of said clerk is to be paid by the owner or owners in addition to any commission or fees due the architect. The selection and dismissal of the clerk of the works are to be subject to the approval of the architect.

Extra Services.—Consultation fees for professional advice are to be paid in proportion to the importance of the question involved, at the discretion of the architect. None of the charges above enumerated cover professional or legal services connected with negotiations for site, disputed party-walls, right of light, measurement of work, or services incidental to arrangements consequent upon the failure of contractors during the performance of the work. When such services become necessary they shall be charged for according to the time and trouble involved.

Drawings and Specifications.—Drawings and specifications as instruments of service are the property of the architect.

ENGLISH PLUMBING PRACTICE.

BY A JOURNEYMAN PLUMBER.

No. LXI.

(Continued from page 300.)

SOIL-PIPES (CONTINUED).

PLUMBERS' work done about twenty years ago, and which recently has had to be taken out, has very often been found to be of good materials and workmanship but badly arranged. In first-class work it was usual to branch waste-pipes from all kinds of fittings into the water-closet trap. Figure 1 is a sketch of a trap with four ends of waste-pipes attached that was taken out a short time ago. A was the waste-pipe from the lead safe on the floor under the water-closet, B was that from the cistern fixed over the water-closet, C was the waste-pipe from a wash-hand basin, and D from a small sink fixed on the floor above.

Figure 2 is a sketch of some old work recently taken out of a building in Lincoln's Inn Fields. It transpired that this job never had worked properly, although a plumber, about two years ago, took out an old D-trap from under the water-closet and fixed one of a better description. In the figure, E is a sink in the scullery, L a bath, F a small sink on floor of staircase landing, G waste-pipe from water-closet safe, I waste-pipe from cistern over water-closet, H the water-closet trap, K the joint of trap to branch soil-pipe, soldered on the top side, and red-lead cemented on the under side. The whole of this work was fixed in the caretaker's apartments on the top floor. Every time the water-closet was used puffs of foul air were sent out of the various waste-pipes, and when the scullery-sink was used dirty water would flow up into the bath and the sink on the floor. The caretaker, to prevent this, was driven to cork up the bath and sink waste-pipes, the corks being removed when those fittings were used. After doing this he was continually sending for the plumber to unstop the waste-pipe from the sink E. Very little comment is necessary; the veriest tyro will see at once the stupid arrangements. It may be added, however, that when the waste-pipes from L and F were corked up the horizontal waste-pipe would

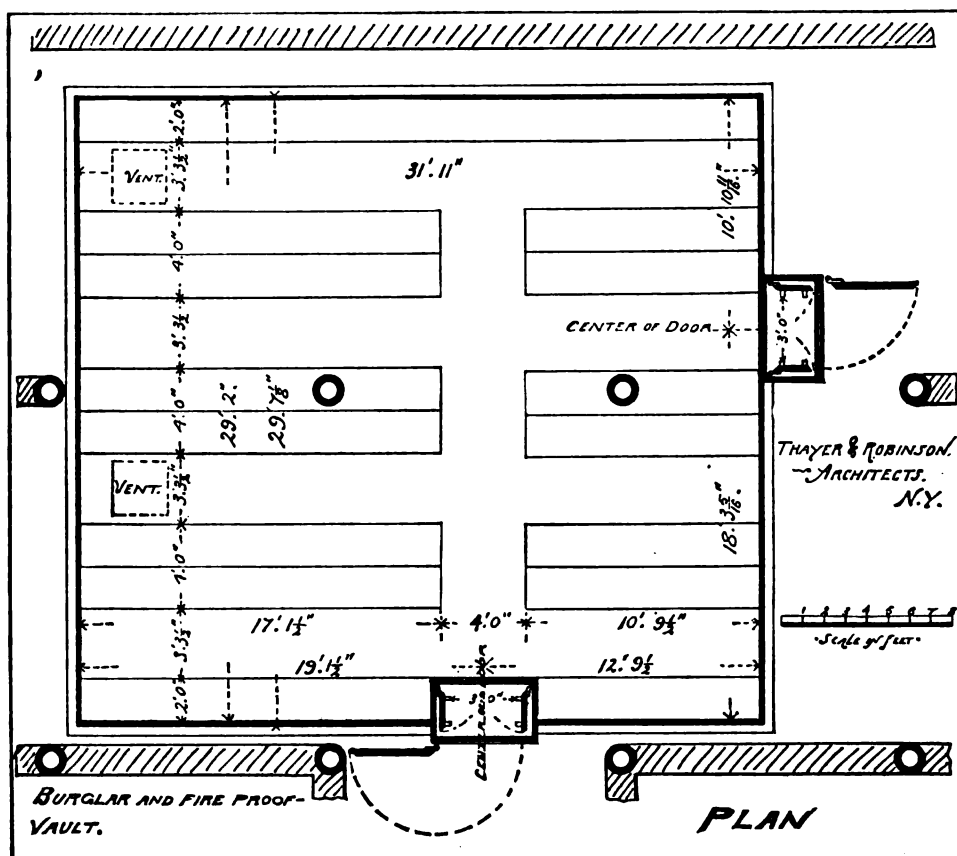
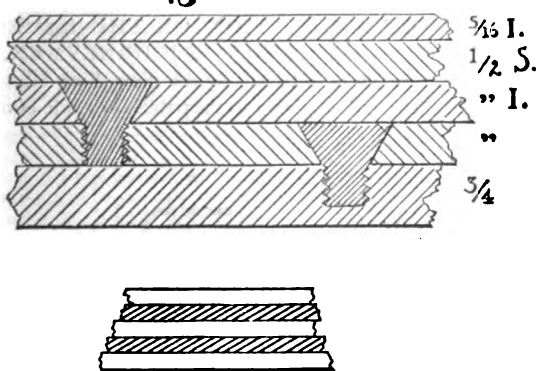


FIGURE 1.

Fig. 2.



ances, such as a movable trunk, which is placed at the top of the vault-door during the day, charging the air by exhaustion.

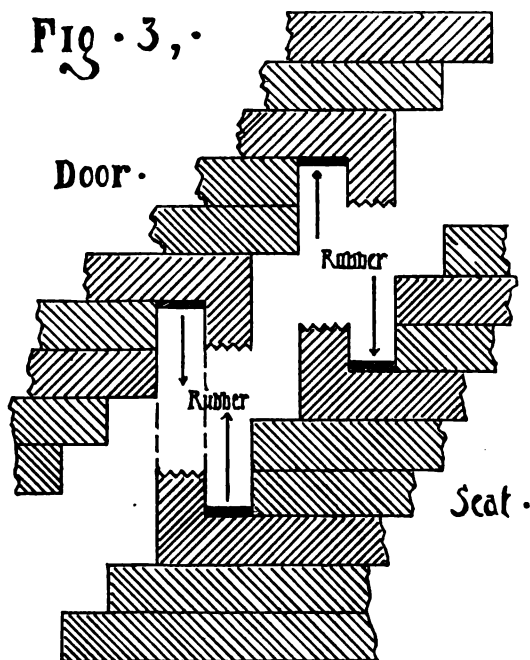
In the present case two openings are made in the top of the vault, fitted with covers made like the doors, but fastening from the inside.

With trunks to these openings—forcing in at one and exhausting at the other—the air is constantly changed. When the vault is to be closed the trunks are disconnected, the cover screwed close, and the shell is complete.

As a further protection against fire, the vault is inclosed in a 6-inch casing of fire-proof material.

This vault was designed by and is being constructed under the supervision of Messrs. Thayer & Robinson, architects, of this city, the builders being Messrs. J. B. & J. M. Cornell, of New York.

Fig. 3.



and additions, an additional charge to be made for surveys and measurements. An additional charge to be made for alterations or additions in contracts or plans, which will be valued in proportion to the additional time and services employed, necessary traveling expenses to be paid by the client. Time spent by the architect in visiting for professional consultation and in the accompanying travel, whether day or night, will be charged for whether or not any commission, either for office work or for supervision, is ren-

become air-bound by reason of its being trapped and retaining water in the bagged parts. Before the branch-pipes were corked the pent-up air could escape and thus allow the waste-water to escape past. Several instances of this kind of botch-work could be given, but the writer refrains, thinking that perhaps his readers would be under the impression that their credulity was being drawn upon.

To return to soil-pipes. Figure 3 is a plan of horizontal soil-pipes for water-closets which had traps attached to the apparatus. The writer was working with several other plumbers, about eighteen years ago, at a large public hospital where several ranges of water-closets had the soil-pipes fixed as above plan. The vertical soil-pipes were of lead, six inches in diameter, and continued to roof as ventilators. The horizontal pipes were five inches, and the branches were $4\frac{1}{2}$ inches in diameter. The floors were fire-proof, and, so that they should not be impaired or weakened by cutting any part away, it was decided to fix the branches as shown in preference to having one horizontal pipe to each range of water-closets, for the reason that little or no fall could be given to a long length of pipe unless a step up was made to the water-closets. Steps should be avoided as much as possible to all water-closets, more especially in a hospital for sick people.

Figure 4 is a plan of several soil-pipes that were fixed in the same hospital where it was required to have two water-closets side by side. In this case there were four floors, the same arrangements being carried out on each. The seats were arranged as shown by dotted lines. That on the right-hand side had to be kept forward, otherwise the flap would not remain open because of the splayed angle of wall.

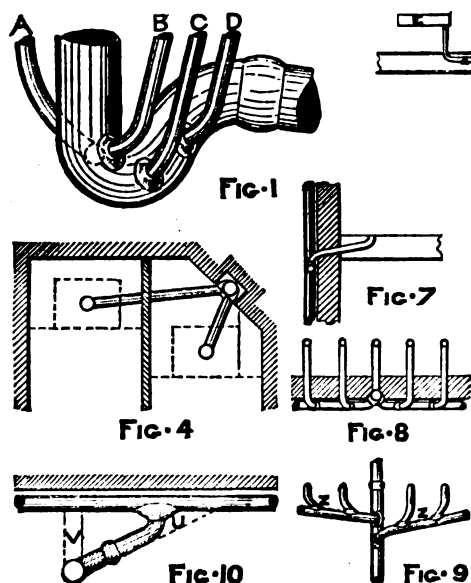


Figure 5 is an elevation, Fig. 6 a plan, and Fig. 7 a section on A B of a range of water-closets fixed several years ago at a London railway-station for the use of the passengers. The water-closets were on a level with the platform, which was about forty feet above the level of the street. The reader is referred to the branch-joints, which are all at right angles to the main soil-pipes. The branches at X Y, Fig. 5, are badly arranged, as what came down one horizontal pipe would doubtless rush up the one opposite, and perhaps lay there until a discharge from one of the water-closets on that branch would again wash it up into the first one.

Similar work was being done at another station by different men, when the above evil was foreseen and precautions taken to prevent what has been described from occurring. Figure 8 is a plan, and Fig. 9 an elevation, showing how, in this other case, the branch-joints were made good to the vertical pipe. It will be seen that it was impossible for matter to rush down one pipe and up the one opposite. In addition to the branch-pipes being jointed to the vertical pipe at different levels, they were arranged so that they entered at the front side, or nearly so. At Z Z, Fig. 9 is shown how the branches were made good to the horizontal soil-pipe, the bottom ends being bent so as to direct the current in the proper direction. There is no doubt that those shown in Fig. 5 would cause the stream of water and faecal matter to be directed on the bottom of the horizontal pipe in such a way that part would be driven up the pipe, where it would lay until a discharge from a fitting higher up would send it down again. The illustrations, Figs. 3, 4, 5, 6, 7, 8, and 9, are all of soil-pipes prepared to receive water-

closets that were made of one piece of earthenware—that is, the trap and basin were combined.

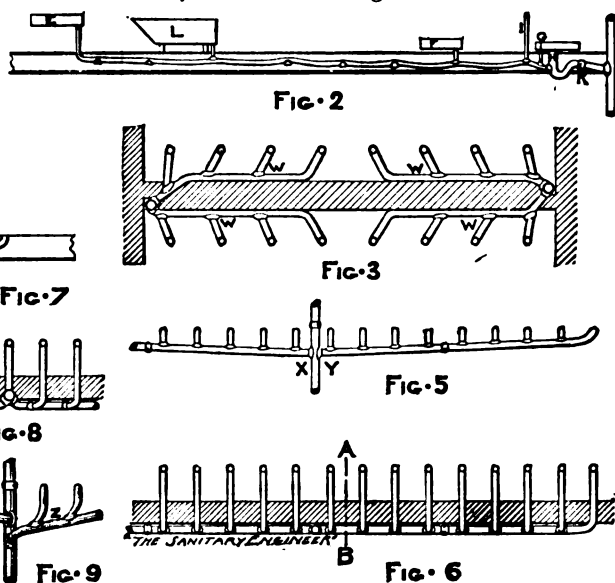
Referring again to Fig. 3, it will be noticed that the short pipes branched into the horizontal soil-pipe have the connections made in such a way as to reduce to a minimum the liability of the discharges from the water-closets running back up the main soil-pipe. The branch-joints when made in this way require to be carefully fitted, or little spurs of solder will be found inside when finished. They also require about half as much more solder, and a thin cloth to be used, so that as much solder can be wiped out of the throat of the acute angles, W W, as possible.

Some little time ago the writer was acting as foreman on a large job, and instructed the plumbers to make the branch-joints of a soil-pipe for a range of water-closets in the same manner as shown at Fig. 3. Unfortunately, he fell sick and was away for some few days, and when he came back found part of the work done and fixed, the joints being made as shown at Fig. 10. It was very difficult to make the men understand that the object sought was entirely lost by bending the end of the branch soil-pipe in such a way that it entered the horizontal pipe at right angles, and that the work would have answered just as well, and the labor to the bend saved, if the pipe had been branched as shown by dotted lines at V. It is scarcely necessary to add that the joints were intended to be made as shown by dotted lines at U.

(TO BE CONTINUED.)

PLUMBING OF THE WEST MIDDLE SCHOOL, HARTFORD, CONN.

A HARTFORD correspondent sends us, as below, a description of the drainage in the additions to the West



Middle School, and a plan of the building and drains. The problem here was to modify the defective sanitary accommodations of the existing school building, so as to give good results from a sanitary point, and avoid any offense to neighboring properties and any unsightly additions to the school building itself. Several plans were suggested, for a

additions, made to harmonize with the general design. Two of these at one end are for girls, and two at the other end for boys, thus separating the closets of the sexes. The fixtures are on the main floor a few inches above ground-level, connecting with the play-rooms in the basement by easy flights of steps. Ventilation of the closet-rooms is to be sought for by the entrance of air at louvered openings near the floor, and its passage out through transoms near the ceiling. The pavilions will be heated by steam. The contract calls for the completion of the work the 20th inst.; the estimated cost was \$9,825 for the four pavilions, of which \$3,500 was for plumbing and \$1,000 for heating.

HARTFORD, CONN., September 11, 1886.

SIR: Possibly some of your readers might be interested in the plumbing improvements at the West Middle School, a printed description of which I enclose. The parts of plan colored in solid black are the new portions.

A main drain, varying from four inches to eight inches diameter, takes the sewage and roof-water to the Niles Street sewer. At the nearest pavilion to that point the main trap is placed, with 8-inch air-inlet pipe protruding through the outer wall seven feet above the ground on the south-west corner to take the prevailing winds.

The drains inside and between the pavilions are of extra heavy iron, and in each pavilion is a sewer-vent of 4-inch pipe running above the main roof, with the upper section, 6-inch, protected by a brass wire screen.

The main floor of the pavilions is six inches above the ground, and all the main soil-pipes with branches and traps are placed in a cellar underneath. Owing to the necessary pitch of main drains they are below level of cellar floor at the south pavilions, but are solidly encased in concrete of hydraulic cement. A single pipe in each of these two pavilions takes all the wastes from fixtures at a central point and runs down to the main drain.

The urinals consist of double stacks of stalls, each partition of which consists of two layers of $\frac{1}{2}$ -inch clear glass, the rough sides of which are placed together and firmly cemented with white putty so the surface presents a smooth, white, impervious wall over which a constant flush of water is allowed to pour from the tank above. The floor is 1-inch glass bedded in the white putty. The boys' sinks are of earthenware.

It will be noticed that pupils must pass from main building into an open porch before entering any pavilion. This is done to exclude all odors from the school-rooms.

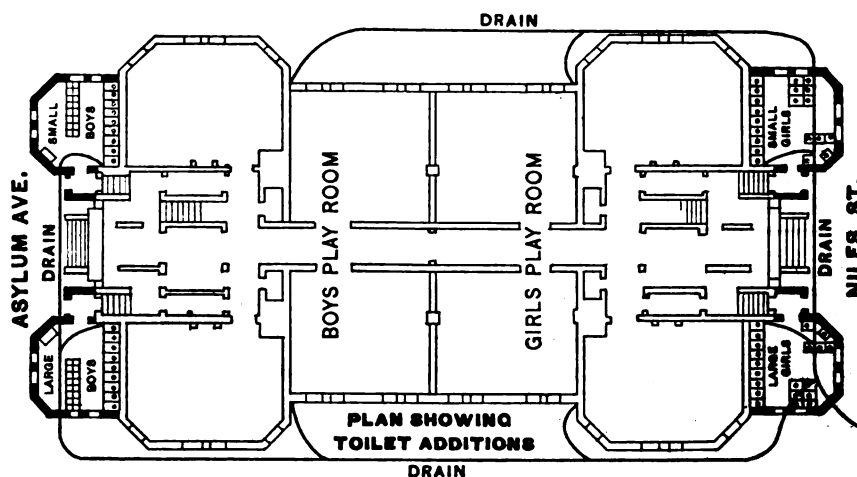
One simple, but, it is hoped, effective contrivance, is the arrangement of louvered windows at the level of the floor where pure air is most needed.

The rooms are twenty feet high, all walls and the ceilings being a glossy white and impervious, and it is thought that the air will thoroughly circulate through the pavilions, escaping at the transoms near the top.

Watson H. Bliss is the contractor for the construction, and Birch & Co. are the plumbers; the architect is Melvin P. Hapgood, all of Hartford.

STATEMENT BY THE NEW YORK MASTER PLUMBERS' ASSOCIATION ON THE ISSUES BETWEEN THEM AND THE JOURNEYMEN.

We print below a statement by the New York Master Plumbers' Association, giving to the public their side of the



detached water-closet building, for closets in the basement, with a system of forced or natural ventilation, towers to contain the fixtures—but all, either from high cost or objectionable features sanitarily, were rejected, and the pavilion plan adopted. As shown on the plan, this consisted in erecting at the corners of the main structure four pavilion

dispute existing between them and the Journeymen Plumbers' Union over the apprenticeship question. The journeymen's statement of the reasons for their action was given in our last issue. Our readers have already had, in previous issues, the texts of the two cards, by the journeymen and by the masters, giving rules to govern the apprenticeship

question, which are referred to in the last paragraph below:

NEW YORK, September 18, 1886.

To the Public:

A deadlock of an unfortunate character is just now affecting the plumbing business in this city. In the great majority of the shops, the journeymen have quit work on an issue that threatens grave consequences—they demand the dismissal of three out of four of the helpers, and also that those who are retained shall be selected and governed exclusively by the rules of their Union.

The demand is so extreme and so unjust to large numbers of young men, who have already served from one to four years, that common sense, self-respect, and a regard for the rights of the community have impelled several hundred of the employers to resolve to keep their shops closed until the journeymen recede from their outrageous position. The journeymen, it would appear, assert that their demand is solely for the interest of the public, to prevent the employment on work, which they claim belongs to them, of boys who are incompetent. This argument is so frivolous that it hardly needs a reply—for it is preposterous to suppose that a plumber would risk his reputation by employing inferior help, thereby giving dissatisfaction to his customers; and next, the great majority of men and boys are employed on contract work, on which only the better kind of labor is made use of because it is the most economical—and being contract, implies that the employer is the best judge of his own interests.

But is this tender regard for the interest of the public the real reason for the course the journeymen have adopted towards the boys who have been educated in our public schools at great expense to the taxpayers, and who are expected to take their places in the ranks of industry as the mechanics and supporters of families of the future? Plainly it is not.

The journeymen think that the trade is about to be overcrowded, and they have resolved to put in force a policy of repression that will diminish the supply and thus create a greater demand for their own labor. No matter what injury is done to others, whether boy, employer, or the public who pays for the work—all must be subservient to the intolerable claim that they are the only ones worthy of consideration. The danger to the journeymen is after all only fancied—the custom of having a helper for each workman is an immemorial one—prevalent in Europe as well as in America, and yet the demand is on the increase. The reason is clear. Owing to the advance of sanitary science—the demand for a high class of work—the variety and number of appliances, and the universal introduction of water supply and sewerage—a field has been opened to plumbers that no other trade has had the advantage of. It may be asserted without fear of contradiction that for the last ten years the growth of the demand for plumbing has increased tenfold in large cities.

Attention might be directed to the bearing this question has on the future of the trade as revealed by its capacity for almost unlimited expansion. The safety, the health, the comfort and economy of time and labor have become so evident to the inhabitants of towns and cities that systems of water-works become almost the first necessities to be provided for. This necessarily means mechanics who understand laying water-mains—the fitting of baths and sinks and closets—and the numberless uses that water can be put to as the nascent city emerges from its swaddling clothes. It seems almost an absurd question to ask whence are our plumbers to come from if the dog-in-the-manger policy of the New York journeymen plumbers should gain the upper hand. These journeymen are shutting themselves out from their best future prospects, as naturally many of them look forward to the day when they too will be proprietors of their own shops, and have to look around for the assistance needed for the prosecution of their business. Large cities like New York, Philadelphia, Boston, Chicago, etc., should be looked on rather as schools for the future supply of plumbers than merely as places where journeymen can earn a day's wages for present sustenance.

Suppose the learned professions—as the medical, or engineering, or legal—should to-morrow resolve to shut up the colleges and schools whither so many of the best talent of the country resort for studying the means of making themselves independent and valuable members of society: what would be thought of the intelligence or honesty which would dictate such a course?

It would be a blow at their future welfare that nothing could retrieve. And yet journeymen plumbers have the hardihood to attempt in the latter part of this nineteenth century what all thoughtful and intelligent men revolt from. It might be urged with some force against the journeymen's view that even under the system that at present obtains, something more remains to be done, or else why the demand for technical schools on the part of the public and their actual establishment in a few of the greater cities. Attention might be directed to the handwriting on the wall, that if we must have plumbers, they can be procured without the assistance of messieurs the journeymen.

It may be because they feel the precariousness of their position that they boldly seize the broom like our old friend, Mrs. Partington, to keep out the tide that they imagine is surging upon them.

Joking apart, the journeymen should take a sober second thought of their action, and like sensible men and law-abiding citizens resolve to abandon their wholly untenable position and recognize that it is too late to go back to the customs of the Guilds of the Middle Ages who guarded so jealously the rights and immunities of their trades and

very frequently to their serious detriment. Instances are not wanted where industries have been completely ruined by the narrow-minded policy of exclusiveness. The *Evening Post* lately alluded to the sand-paper makers of London, who protected themselves against outsiders so effectively that they drove the whole trade over to Holland. Even New Yorkers can remember when this city was a great ship-building port. What has become of the ship-carpenters, joiners, blacksmiths, calkers and riggers—gone, and by whose action? By their own selfish, short-sighted policy of attempting to dictate to their employers and the public.

In order to thoroughly realize the full nature of the intolerable demands made on the employers by their journeymen, an inspection and comparison of the enclosed card, containing the rules of both bodies, will suffice to convince any intelligent and candid person that, yielding to these exactions means the destruction of the present class of employers, as the control of their shops will have virtually passed out of their hands.

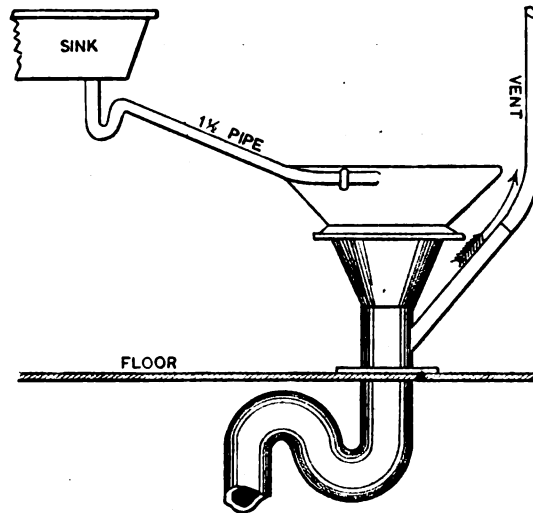
Committee of Observation of the Master Plumbers' Ass'n.

USING SINK WASTE WATER FOR FLUSHING WATER-CLOSETS TO AVOID WATER TAX.

OUR attention was recently called to some water-closet basins, known in the trade as "French closet-bowls." The arm for the flushing water to enter had an internal area sufficiently large to hold a $1\frac{1}{2}$ -inch lead pipe. Curiosity as to the cause of this, since a flush from a cistern through a pipe of that size would certainly cause an overflow, induced us to make inquiries. We learned that large numbers of bowls of this character were used in Fitchburg, Mass. On writing to Fitchburg for information, we received the following frank reply, and we make the accompanying sketch to illustrate the explanation:

"Closets as shown in your sketch to waste from sink used for the past twelve years. A large arm French closet-bowl is used that is made to order, with arm large enough to receive $1\frac{1}{2}$ -inch lead pipe. Enamelled ventilating hopper is also used, and the sink waste-pipe is trapped close under sink. This makes a good thing for cheap class of houses, can be put in cold places by putting trap out of the way of frost, and nothing to get out of order; nor until the past year any water-rates to pay. They now charge \$3 per year for closet of this kind. Although I think this was brought about by the trade, as the plan was hurting the sale of first-class closets. Where located right the water as used from sink will keep the closet all right."

Doubtless, many of our readers will be amazed that in so enlightened a State as Massachusetts, from whence so much sanitary instruction has gone forth, there could be found a community which would allow their instincts to



evade a water-tax to be so rooted as to make them satisfied with such a filthy arrangement as we have here described. The condition of the closet-bowl may better be imagined than described, since no mention is made of any appliance for turning water into the sink by the person using the hopper. For several years past we have taken considerable trouble to furnish our plumbing readers with descriptions of novel work, with a view of not repeating our descriptions too often and placing ourselves liable to a charge of giving elementary articles on house-drainage. The Fitchburg novelty would, however, seem to indicate that the missionary work done by THE SANITARY ENGINEER several years ago in favor of plumbing reform should be repeated, since some of the beneficiaries have evidently forgotten what they learned, or died, and another set have come into the field. If Fitchburg has a board of health it should tax every water-closet that is not properly flushed, and the water company should see that the citizens pay a water-tax whether they use water or not, and pay a penalty when they waste it.

Correspondence.

A QUESTION IN ARITHMETIC FROM AN APPRENTICE.

PHILADELPHIA, September 13, 1886.

SIR: On looking over your edition of the second of this month, we find an article headed "The Capacity of Boilers." We find in the answer, multiply 15×15 brings 225; multiply this by .7854, the result is 176.715. Multiply this by 48, the result is 8,482.3200. Why do you drop the final cyphers? Also, when divided by 231 the result is 36.72. Why do you drop the 2? Also, where do you obtain the .7854? Please oblige by answering in next edition. Yours truly, FRANK, CHARLIE.

[We drop the final cyphers because they are of no value and will add nothing to the answer, and would make it read three thousand two hundred ten thousandths; whereas thirty-two-one-hundredths will be the same in amount and serve the purpose much better.

We drop the 2 because we thought it unnecessary to carry the matter farther than the first decimal in such a calculation. The .7854 (decimal) is the fraction of a square inch contained within a circle one inch in diameter, and will read seven thousand eight hundred and fifty-four ten thousandths of an inch, or any other unit of surface measure. To find the area of a circle, square the diameter in inches and multiply by the .7854, and the answer will be the number of square inches within the circle.

Example: 12-inch circle, $12 \times 12 = 144 \times .7854$ ($\frac{7854}{10000}$) = 113.09 square inches area of circle. If the diameter is taken in feet, why the answer will be in feet.

We advise Frank and Charlie to go to the Philadelphia Trades School, and ask for instruction in decimal fractions.]

WHO MAKES IRON-WELDED GAS-FIXTURES?

FORT WAYNE, IND., September 17, 1886.

SIR: Will you please give us the address of the parties who make the new welded iron gas-fixture? A party here asks for it, and we have not as yet had any information of it. It is a new thing in the fixture line. We are told it has been seen in Chicago and New York. It will be some favor to us if you will give us the manufacturer's address and have them forward us plates and prices.

Yours, MADDEN & COX.

* [Referred to our readers.]

COMPARATIVE VALUE OF ONE-PIPE AND TWO-PIPE SYSTEMS OF STEAM-HEATING.

SYRACUSE, N. Y., September 14, 1886.

SIR: We notice in your last issue an inquiry from Providence, R. I., asking information concerning the one-pipe system of steam-heating. We notice your answer favors the two-pipe system and is entirely contrary to our experience with the heating of the one-pipe system. You claim it is impossible to operate the one-pipe without water-hammering. We formerly used the two-pipe system for at least ten years, and have now abandoned that entirely, and for the past twelve years have adopted and used only the one-pipe system. We have entire blocks heated by this system and do not experience the least difficulty. The radiation in some places is some 300 feet from the boiler and from two feet to three feet above the water-line, still we do not experience any noise or complaints from hammering or location of water in the radiation. Our work is all done on the one-pipe system, and we think if you would investigate the matter thoroughly you would find that this system is far superior to the old two-pipe. You claim that there is only a difference of ten per cent. in the cost. Our experience would place it at a much higher figure. The great difficulty in the one-pipe system is in understanding it thoroughly. The piping should be larger and all radiators above fifty feet should contain $1\frac{1}{2}$ -inch valve, below that $1\frac{1}{4}$ -inch valve. With proper attention paid to these particular items we think there need be no difficulty with the one-pipe system. We also find many people who have always used the two-pipe system and have become prejudiced, and do not adopt the more modern system, but think eventually they will be obliged to do so if they wish to meet close competition. Pardon us for criticising your opinion, but we have had so large an experience we thought we would mention it and would invite you to inspect some of our plants in our immediate vicinity, as we think we can convince you that the one-pipe system is not only cheaper, but far superior and better than the two-pipe.

Yours very truly,
PIERCE, BUTLER & PIERCE.

[We have not changed our opinion of the relative merits of the two systems. With equal care, knowledge, and experience in all cases we are still confident the two-pipe system will be proved superior in the majority of conditions, pressures of steam, and use they are likely to be subjected to. With regard to relative cost, if our correspondent wishes to give the figures of cost on the two different systems of heating for a house 40'x40', two stories high, with

basement eight feet in the clear, there being four rooms on each floor, or eight rooms, each 16'x16', with ten feet height of ceiling, we will be glad to publish them. To simplify the question, we will assume direct radiation [with forty square feet to a room.]

A RADIATOR-SCREEN TO PROTECT SIDE WALLS WANTED.

NORFOLK, VA., September 19, 1886.

SIR: Will you, or some of your readers, kindly inform me, in your Correspondence Column, where I may get a steam-heating "radiator-screen?"—a screen alike useful and sightly, that shall avoid the soiling of side walls and ceilings just over such radiators from dust, etc., carried by heated air and so wafted upward. This accumulating, especially over indirect radiators, calls for correction and avoidance. Are such screens made, and where may they be found? Your answer will greatly oblige

A NORFOLK SUBSCRIBER.

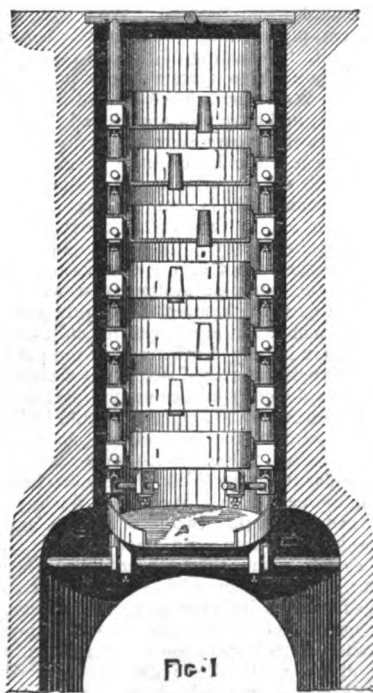
[Referred to our readers.]

Novelties.

Under this heading we propose to describe and illustrate appliances of probable interest to our several classes of readers. The selection will be made without reference to the wishes of agents or patentees, being governed solely by considerations of novelty, ingenuity, and probable interest to readers, and especially the fact that they have not been elsewhere described. As a rule we shall make no comments, and it is to be distinctly understood that a notice does not imply approval. No charge will be made for these notices, and any offer of pay for their insertion will insure their omission. We shall be glad to have our attention called to novelties suitable for this section.

APPARATUS FOR FLUSHING SEWERS.

THE accompanying illustrations show a novel device for flushing sewers, to be used in the ordinary manhole, and lately patented by Mr. James Scott, of Denver, Colorado. The Figs. 1 and 2 show the apparatus partly in section and partly in elevation, when in place within the manhole, the sections being at right angles to each other. A water-supply pipe enters the manhole near the upper end. Across the catch-basin at the bottom is secured a horizontal supporting bar, which is provided with vertically projecting laterally adjustable stop-lugs which are secured at any suitable adjustment on the bar by means of set-screws. A pair of vertical standards, which depend from a frame, composed of two crossed bars, are placed on the upper side of the manhole. The lower ends of the standards are provided with diverging points which extend on opposite sides of the bar and support the lower ends of the standards. To the standards are secured the edges of a vertical convex guard-plate, which corresponds in length

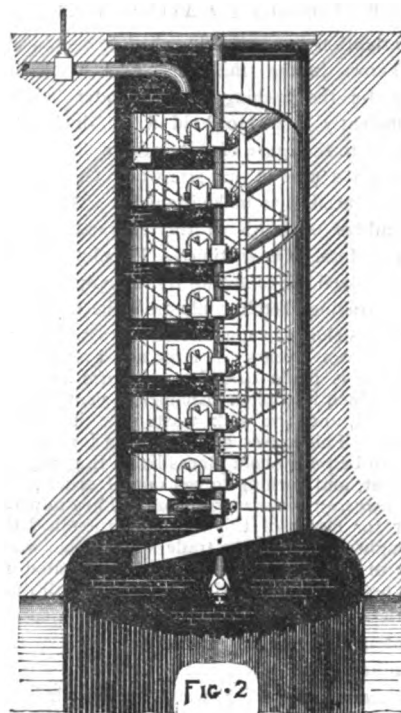


to the standards, and is provided at its lower end with the inclined discharge-spout.

A pair of horizontal arms is provided at the inner ends with sleeves which fit on the lower ends of the standards, and, being provided with set-screws, may be secured on the standards at any desired vertical adjustment. On the outer ends of the arms are sliding boxes, which carry buffers which are made of rubber or other suitable material. The boxes are provided with thumb-screws, by means of which they may be secured on the

arms at any desired adjustment. Above the arms on the standards are secured other arms which are similar in construction to the arms before mentioned, but are somewhat shorter than the latter. The sliding boxes on the outer ends of the arms are provided on their upper sides with notches, the sides of which form obtuse angles.

A series of pans are provided at one end with an inclined discharge-spout, and having trunnions projecting from opposite sides, which are so arranged on the pan as to exactly balance the latter on the supporting boxes when the said pans are filled with water. The trunnions are V-shaped, and rest in the bottoms of the notches, pivoting the pans on the boxes in such a manner as to have very slight friction on the journals. The upper pan is provided at one end, opposite the discharge-spout, with a counterbalancing weight. Each of the pans is provided with a vertical tube, which extends nearly to the top of the pan, tubes being open at their upper and lower ends, and the



tube in each pan being arranged out of line with the tube of the subjacent pan.

The lower pan, which is provided with a discharge-spout and V-shaped trunnions, is of corresponding size and construction with the other pans.

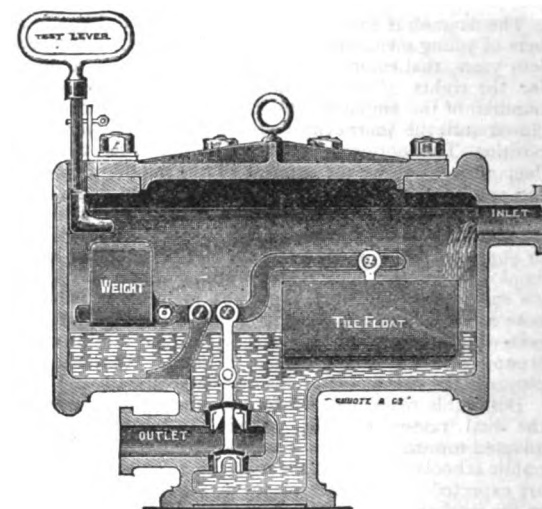
A vertical connecting-bar connects the pans by pivots.

The operation is as follows: The water from the pipe falls into the upper pan and fills it until the water reaches the level of the top of the overflow tube, when it falls through the said tube into the pan below and fills the latter until the level of the top of its overflow-tube is reached, when the same operation is repeated until all of the pans become filled. The lower pan not being balanced on its bearings when it becomes filled, the weight of the water in the end provided with the discharge-spout is greater than that of the water in the other end of the pan, thus destroying the equilibrium and causing all the pans to tilt to the position shown by the dotted lines (Fig. 2), causing the water to discharge against the guard-plate, and thence into the spout into the sewer.

STEAM-TRAP.

THE accompanying illustration represents a section of a solid-float steam-trap. It consists of a circular casing of cast-iron, in the bottom of which is a well; suitable provision is made in this well for taking an ordinary balanced stop-valve, the interior of the latter communicating with the outlet-pipe as shown. The diameters of the upper and lower valves only differ by a very small amount, so as to make the balance as nearly equal as possible. The spindle of the valve is connected (by means of a short link) to the float-lever at a little distance from its fulcrum. It will be seen that this trap differs from others of its kind, inasmuch as the lever is continued on each side of the fulcrum, and has a weight at each end, the larger one on the right being a tile float, and the smaller one on the left being made of such heavy metal as lead. The advantage of this arrangement is that the weights may be so adjusted as nearly to

balance each other, thus making the apparatus sensitive, and at the same time—owing to the large volume of the tile float—there is a great lifting force as soon as the water accumulates in the vessels. By virtue of the left weight having a specific gravity so much higher than the tile float, the lifting force on the valve is not diminished, even should the former weight become immersed in water; this will be readily understood by a little consideration. A test-handle is pro-



vided for the purpose of testing the trap while at work. This is convenient whenever it is deemed advisable to blow through or test the trap, or to remove grit that may have settled on the valve-seatings, or say in a morning when the pipes are cold and it is necessary to get rid of all the air; in the latter case the handle can be held down by means of the peg until all the air is expelled.

The patentees of this trap are Messrs. McDougall and Sugden, and the sole makers are the Chadderton Iron-Works Company, Limited, Chadderton, near Manchester. —*Mechanical World.*

Gas and Electricity.

Illuminating Power of Gas in New York City.

Week ending	New York Gas-Light Company.	Manhattan Gas-Light Company.	Metropolitan Gas-Light Company.	Mutual Gas-Light Company.	Municipal Gas-Light Company.	Kickerbocker Gas-Light Company.	Equitable Gas-Light Company.
September 18.	24.88	20.60	22.52	30.48	28.81	22.83	32.25

E. G. LOVE, Ph.D., *Gas Examiner.*

THE Mayor of Toledo, O., has signed an ordinance which gives to the North-western Gas Company the privilege of opening streets and laying mains for the supply of natural-gas.

THE Western Union Telegraph Company recently strung wires on the structures of the elevated railroads in this city. The matter having been referred to Corporation Counsel Lacombe, he has advised that it is in the power of the Police Department to issue orders to police officers to arrest summarily, without warrant, any person found placing wires above ground.

THE Charleston *News and Courier* reports the belief of officers of the Gas-Light Company that great damage has been done to the gas-mains by the recent earthquake.

ASSOCIATED PRESS dispatches dated September 13 describe the trip of the electric launch "Volta" across the English Channel, from Dover to Calais. Her speed with smooth sea was less than six miles an hour. The accumulators were charged only once for the out and return trip—about fifty miles in all.

THE fourteenth annual meeting of the American Gas-Light Association will be held in the Academy of Music at Philadelphia, on October 20, 21, and 22.

AT the meeting of the Electrical Convention in Detroit, one member defended overhead electric-wires on the ground that well-constructed lines with trim poles give to streets an air of business. He also claimed that they are a protection against lightning. The President of the Brush Company of Detroit stated that they were lighting the entire city by means of 122 towers, averaging four lights each, and 78 pole lights. The towers are 150 feet high. The cost is \$114,500 per annum.

SANITARY WORK IN CHICAGO AND ITS RESULTS.

THE report of the Department of Health of the city of Chicago for the year 1885 is one upon which the Commissioner of Health, Dr. De Wolf, has a right to expect congratulations. With an estimated population of 664,634, the total number of deaths during the year was 12,474, giving a death-rate of 18.76 per 1,000, and in connection with this comparatively low death-rate it is also noted that the death-rate from zymotic diseases and that of children under five years of age were both lower than ever before.

Much more instructive and interesting than the general aggregate death-rate are the death-rates by wards, taken in connection with the population of the wards by nationalities, and the proportion of sewerage which has been provided for the different localities. Compare, for example, the Sixth Ward, with its death-rate of 23.28, with the Eighteenth Ward, with its death-rate of 11.21. The Sixth Ward has 45.4 feet of sewers per acre; the Eighteenth has 191.97 feet per acre. The Sixth Ward contains 2,722 Americans, 22,578 Germans, and 20,459 of Slavonic races (Poles, Bohemians, etc.); the Eighteenth contains 12,638 Americans, 8,042 Germans, and none of the Slavonic races. These most fairly represent the extremes, and between these the other wards may be arranged in a sort of sliding scale, the mortality increasing with the proportion of foreign population.

The comparatively low death-rate for the whole city is due in part to the favorable meteorological conditions which produced low mortality-rates during 1885 throughout the northern part of the United States, but it is also due in part to the operations of the Health Department, and especially to the results of the systematic inspection made in anticipation of the advent of cholera.

This inspection included 54,642 buildings occupied as dwellings, containing 101,532 families, consisting of 467,399 persons, of which 173,916 were children under 15 years of age, and resulted in extensive improvements and repairs, more especially in the matter of house-drainage.

A specially interesting feature of the report is a tabulated statement of trades and occupations, with the number of persons employed in each, and the highest and lowest wages paid. This will be of permanent historic value, and it is much to be desired that similar data should be obtained for other large cities in different parts of the country.

THE FEVER AT BILOXI.

At the end of August several cases of fever occurred at Biloxi, a small town on the Gulf Coast of Mississippi. These cases being considered suspicious, were examined by Dr. Joseph Holt, the President of the Louisiana State Board of Health, by Dr. Salomon, of New Orleans, and by Dr. Scales, of Mobile—all of whom are considered experts in the diagnosis of the fevers of that region. These gentlemen, after investigation, declared that the disease was probably yellow fever, and advised a quarantine against Biloxi, which was duly established. On the other hand, the physicians of the locality thought that it was not yellow fever, and Dr. Godfrey, of the Marine Hospital Service, who was sent there to investigate the matter, concurs with them. No more cases have occurred, the quarantine has been raised, and the people of Biloxi are in a state of great wrath against Dr. Holt.

It would seem, however, that he only did his duty, and took the safest course in a doubtful case.

NOTES.

In connection with the jubilee year of Queen Victoria, it is proposed to establish in London a permanent imperial colonial and Indian institute on the basis of the present Colonial Exhibition.

THE New York City Board of Health has appointed a corps of vaccinators to make vaccination free of charge. They will visit the public schools and institutions. Their work will continue through October and November.

THE Brooklyn Society for the Prevention of Cruelty to Animals has issued a circular calling the attention of Owners of horses to the danger of watering their horses at the troughs in Brooklyn, by reason of much glanders which is scattered throughout the city.

A PATIENT in the Flatbush, L. I., Insane Asylum was scalded to death last Sunday by being placed in a bath filled with excessively hot water. This seems a case to be thoroughly investigated.

THE National Board of Health has taken down its sign, stored its furniture, and can now only be said to have an office in the residence of its secretary. This course has been rendered necessary by the fact that no money was granted it by Congress.

THE Grand Jury in Milwaukee has found indictments against B. J. Johnson, a West Water Street soap manufacturer, and William Bergenthal, of the Meadow Springs Distillery. They have given bail for \$300, and their trial will take place this month. Three bone-fertilizing men have also been indicted.

THE State Board of Health of Kansas held a quarterly meeting at Topeka September 9, at which papers were read and discussed, in addition to the transaction of routine business. The State sanitary meeting was appointed to be held at Wichita, in December, and Drs. McCullagh and Welch, of that place, were made committee of arrangements.

Dr. A. W. CANTWELL has been appointed by the City Council of Davenport, Iowa, delegate to the Toronto meeting of the American Public Health Association.

AN adroit method of "beating the meter" was lately discovered by the gas inspectors in Philadelphia. As the meter failed to register the consumption of as much gas as it seemed must be burned in the establishment (a drinking-saloon), the meter was examined and found to be all right. Then suspecting some fraud, the inspectors noticed that a part of the foundation-wall where the service came through seemed to have been disturbed. This place was taken down and the mystery disclosed. It was found that a branch-pipe had been taken from the service and carried along on the foundation-wall out of sight, until it could be connected with the pipe supplying gas to fixtures. Thus most of the gas used passed around the meter, which registered only a small quantity taken through it to serve as a blind. The saloon was forthwith cut off.

CHIEF INSPECTOR GUNUNG, of the Health Office of Chicago, has prepared a bill providing for the thorough inspection of tenements, lodging-houses, and other places of habitation. It is designed to look carefully after all sanitary considerations in these buildings while in process of construction, and prevent complaints, delays, and difficulties. The provisions of the proposed bill have been submitted to the Western Association of Architects, and the Sanitary Committee of that body has indorsed it heartily. The bill will be presented to the next Legislature for adoption.

THE Milwaukee Industrial Exposition opened September 1, 1886.

Reviews of Books and Pamphlets.

EIGHTH ANNUAL REPORT OF THE STATE BOARD OF HEALTH OF CONNECTICUT, for the year ending November 1, 1885. 358 pp., 8vo. New Haven. 1886.

Besides the report of the Board of Health this volume contains also the registration report of the State for the year 1884, which forms a separate part of 161 pages. In his introductory remarks to this part of the report the Secretary of the Board, Dr. C. A. Lindsley, makes some refreshingly plain remarks upon the work of some of the registering officers. He says: "It can hardly be doubted that many of the elected Registrars of Vital Statistics look upon the whole business as a foolish and unnecessary expenditure of the public money, and are only restrained from expression of such sentiments because the office with its small emoluments is held by themselves. This is the necessary inference one must draw respecting their opinions of the office they administer from the manner in which they discharge their official duties. Because, if they had a true conception of the great value of accurate and complete records, and could appreciate how much that value is impaired by inaccuracy and incompleteness, it is not easy to believe they could do such violence to their sense of duty as to allow the whole system of State registration to be so much impaired and suffer such injury through their personal neglect. The experience of more than thirty years clearly demonstrates that the mode of electing Registrars

of Vital Statistics is at the root of the trouble. The office ought to be by appointment, and only after a competitive examination."

The death-rate for the year 1884, as given by the returns, and an estimated population of 683,577, was 16.6 per 1,000. While this is undoubtedly less than the actual rate by at least 1, and probably 2, per 1,000, it nevertheless shows that the State was fairly healthy during the year.

Turning now to the report of the board for 1885, we find that it is an unusually interesting and valuable document, not only to the residents of the State, but to sanitarians everywhere. Passing over the general remarks on the sanitary condition of the State and reports on the health of towns, which are chiefly of educational and local interest, we come to a series of original papers, the first of which is on the malarial diseases at present prevalent in southwestern New England, contributed by Dr. Rufus W. Griswold, of Rocky Hill. This paper gives a concise but clear historical sketch of progress of malarial affections in that part of the country, more especially since 1860, about which time this form of disease began its invasion of Connecticut. After discussion of the effects of various local conditions, such as the presence of swamps, ponds, decomposing vegetable matter, fresh excavations, etc., Dr. Griswold concludes that none of these, nor any combination of them, is sufficient to explain the appearance of malarial affections, and thinks that the facts point to a special germ or vegetable organism as the efficient cause, although scientific proof of its existence is yet wanting. He predicts that as mysteriously as these diseases have entered, silently but not suddenly they will fade away, "and about that apparently pestiferous marsh and that reeking sewer, alike as in localities where nothing of the kind exists, where ague is now abundantly prevalent, no amount of the most careless exposure will develop a solitary case. New railroads may be built, new sewers constructed, new reservoirs laid up, swamps and marshes remain as of yore, garbage be left to rot, and filth to accumulate, nevertheless intermittent will not be provoked into existence in a single instance, and we shall be as ignorant of the cause of its exit as we are of the reason of its entrance." On which we would comment that while it may be true, the recent advances in our knowledge of pathogenic micro-organisms does not warrant such a wholesale pessimism, and that there is a fair degree of probability that the problems which Dr. Griswold seems to think so hopeless may be solved even within a very few years.

The next paper is by Dr. T. M. Prudden, of New York, on "Koch's Methods of Studying the Bacteria," in which the importance of these methods and of their introduction as part of the practical work of boards of health is clearly set forth.

Prof. W. H. Brewer contributes an article on the right and expediency of public vaccination, written in his usual forcible and agreeable style, in which he makes clear the right but questions the expediency. He points out that "the right to vaccinate implies the duty to have it carefully done with all the safeguards that science can require and experience suggest," and that it is only when this is not done that anti-vaccinationists have any case worthy of a hearing.

The paper on the "Sanitary Examination of Drinking-Water," by Dr. Arthur J. Wolff, of Hartford, is one that is worthy of careful reading, and especially that part of it which relates to the author's personal investigations.

Space is wanting for the notice of several other special papers of interest, but we have probably given enough to whet the appetite and to show that this volume is highly creditable to the board, and should be obtained by all who are interested in preventive medicine.

FOURTH ANNUAL REPORT OF THE PROVINCIAL BOARD OF HEALTH OF ONTARIO, for the year 1885. 163 pp., royal 8vo. Toronto. 1886.

The operations of the Provincial Board of Health during the year, as set forth in the report of the Secretary, Dr. P. H. Bryce, related largely to the completion of the organization of the local health boards of the Province, and the superintendence of their work more especially in relation to outbreaks of epidemic disease. Of these, the small-pox epidemic in Montreal was the most important, and a large part of the report relates to the measures of inspection, disinfection, vaccination, etc., which were employed to prevent its spread.

The results show very clearly the advantage of having a central organization in such an emergency.

The progress of organization is shown by the fact that while in 1884 the province had 391 local boards, 103 medical health officers, and 127 sanitary inspectors, at the end of 1885 it had 570 local boards, 298 medical health officers, and 200 sanitary inspectors.

Among the appended documents is a report of a committee appointed to investigate the sewage disposal of the city of London, the alleged pollution of neighboring streams, and the effects of certain mill-dams upon them.

The committee recommend the construction of an intercepting sewer, and the treatment of the sewage by chemicals for precipitation and purification. Other papers in the appendix are reports on the sewerage of Kingston Asylum, on the sewerage of the town of Woodstock, on maritime and land sanitation, on a vaccine farm, etc. These are mainly educational, and of local interest chiefly.

The appendix also contains the reports of several local boards and health officers. The great want in all these reports is definite and reliable mortality statistics, in the absence of which recommendations for sanitary work are largely a matter of individual opinion.

Contracting News.

For works for which proposals are requested, see also the "Proposal Column," pages 390 and 391.

CONSTRUCTION.

CHEYENNE, WYO. T.—See our "Proposal Column" about bids for constructing a system of filtration for water-supply. William G. Provines is City Engineer.

KALAMAZOO, MICH.—The Water-Works Company think of getting a new pumping-engine if the old one can be disposed of to advantage.

WATER-WORKS WANTED.—Sheboygan, Wis., Common Council has passed a resolution for the introducing of a water-supply, and W. Kunz, City Clerk, will receive proposals until October 15. About 12 miles of pipe and 150 hydrants will be required.

ROCKFORD, ILL., will receive proposals, through E. R. Conkling, City Clerk, for constructing a sewer, until October 1.

ROUND LAKE, N. Y.—City Engineer Landreth, of Poughkeepsie, has made an estimate for sewerage for the Round Lake Association, with flush-tanks, putting the cost at \$6,000. The trustees have decided to construct the work, also to put in a system of water-supply.

WEST RANDOLPH, VT.—On September 25 a special village meeting will be held to decide on a water-supply.

GRAFTON, DAK., will extend its water-works, and has voted to raise \$10,000 on town bonds for the purpose.

LOWELL, MASS., Common Council has passed resolutions authorizing a loan of \$25,000 to build sewers. Local feeling is in favor of doing the work by the day, under direction of the Sewer Commissioners.

BURLINGTON, MICH., will have a system of water-works. C. F. Williams may be addressed.

CADILLAC, MICH.—The intelligent portion of this community are determined to have a system of sewerage.

HASTINGS, MICH.—This town has decided to build water-works.

BALTIMORE, MD.—In the last River and Harbor Bill Congress directed that an estimate be made of the cost of enlarging the channel from a width of 400 to a width of 600 feet. The estimate will be made by Col. W. P. Craighill, U. S. Engineers.

WATERBURY, CONN.—Surveys are making to ascertain the practicability of obtaining a water-supply from Lake Quassapaug.

LITTLE FALLS, N. Y.—A survey was begun last week by Division Engineer J. R. Kaley, to determine the feasibility of constructing a dam at expense of the State across the river here. It is said the undertaking will be a large one.

SOUTH ORANGE, N. J., citizens held a meeting last week to consider water, and passed a resolution asking the Board of Trustees to investigate the matter of making a contract for obtaining a supply, they to report in two weeks. Henry F. Hitch or Morris Mead can give further information.

ASHEVILLE, N. C.—The city has recently appropriated \$70,000 to secure a full supply of water, which will be conveyed through a 10-inch main 4 miles (from the river), and pumped into an iron reservoir of the capacity of 750,000 gallons.

SING SING, N. Y.—This town has voted to issue bonds for the introduction of water; ballot, 157 in favor and 39 against.

MOBILE, ALA., has before it the matter of granting to the new water-works the right of constructing water-works.

WEEHAUKEN, N. J.—Address George Ehret, brewer, of New York City, on a proposed extensive improvement scheme at the "King estate" in Weehauken.

GRAND RAPIDS, MICH.—A movement is on foot by the Board of Health for the erection of a hospital to be used for contagious diseases. The board is also on the lookout for a garbage destroyer.

WILKESBARRE, PA.—The Wilkesbarre Water Company intends to increase the supply, and has received a report from Engineer Sturdevant on several plans: one to bring water by gravity from Harvey's Lake, one to

construct an impounding reservoir near Huntsville, and one to pump from the Susquehanna above the mouth of the Lackawanna.

GRAND RAPIDS, MICH.—The Grand Rapids Hydraulic Company has contracted with Messrs. A. C. Sekell, formerly City Engineer, and George Davidson, to extend the system, at \$90,000. The water-supply is from Silver Spring. At least seven miles of iron pipe will be laid this fall. The company has been very lately reorganized, with the following officers: M. R. Crow, President; John E. More, Vice-President; George B. Sidelinger, Treasurer.

BALDWINVILLE, N. Y.—A water company will be formed here by J. F. Moffett, H. C. Hodkins, and J. V. Clarke and others of Watertown, N. Y., to construct water-works.

EVANSTON, ILL.—There is a proposition before the village trustees to build a \$100,000 sewer. An ordinance has been passed to effect this, but a strong opposition has been developed by parties who will be assessed, and they threaten to fight the matter in the courts.

NEW JERSEY SOLDIERS' HOME.—The commission to build a soldiers' home met last week at the office of Marcus L. Ward, in Newark, to consider the plans. These call for a building to cost about \$85,000. The commission decided to defer building until next year.

BROOKLYN.—The Commissioners of City Works and of Health have determined to ask for proposals for removing garbage. Probably bids will be asked for doing the work during October, November, and December of this year, and a separate proposal advertised for doing it for a term of years thereafter.

UTICA, N. Y.—The City Surveyor has reported to the Common Council in favor of building a trunk sewer in Andes Avenue across the canal and railroad tracks to the river.

ALBANY WATER-SUPPLY.—The new water commission has decided that the driven-well system must be subjected to a thorough test as to quality and quantity before the contract with Andrews Brothers is closed. A guarantee of a daily supply of 10,000,000 gallons for a year will, it is said, be required.

BROOKLYN BRIDGE ENGINES.—The Bridge trustees will put in a 600 horse-power steam engine, in place of the present 350 horse-power, to drive the cable.

NEW YORK CITY.—The Dock Department will let contracts for several new piers on the Hudson and East Rivers.

WARREN, O.—Bullock & Co., contractors, will build water-works here.

AUSTIN, TEX.—The proposition to submit the \$350,000 sewerage bonding scheme to a popular vote was considered in the City Council September 6, and the council refused to let it be voted upon.

BATTLE CREEK, MICH.—Three acres of ground have been purchased here for the purpose of erecting water-works buildings thereon.

BAY CITY, MICH.—Bradley & Finn have the contract at \$6,000 for the plumbing, gas and steam fitting of the new Phoenix Block; also the Opera-House Block for \$6,300.

ALTOONA, PA.—A contract has been made with R. D. Wood & Co., of Philadelphia, for iron pipe, etc., as follows: For 1,836 feet of 4-inch pipe, weighing twenty-two pounds per foot, \$34 for 2,000 pounds; 399 feet of 2-inch pipe, 16½ cents per foot; special castings, 2½ cents per pound; two 4-inch Eddy Valves, \$10.45 each.

BRIDGEPORT, CONN.—The council have accepted the bid of B. D. Pierce, Jr., to furnish to the city from 15,000 to 20,000 tons of trap-rock yearly for five years at eighty-two cents per ton.

ST. PAUL, MINN.—Bids on the approaches to the Third Street bridge, with iron and wooden trestles, were recently opened by the Board of Public Works, as follows: S. P. Folsom, \$38,969; Morse Bridge Company, \$38,809; Michael O'Toole, \$44,610; Keeper & Riddell, \$36,798; Horace E. Horton, \$33,000; F. L. Balsh, \$32,915.50. The bids were referred to the City Engineer and City Attorney.

MILWAUKEE, WIS.—Bids were opened September 14, at the United States Engineer's office, for improvements of the Milwaukee harbor. For the extension of the breakwater in Milwaukee Bay, 350 feet and 650 feet of superstructure, Kerr & Walsh, of Chicago, made the lowest bid, \$50,041.24. For cutting down and rebuilding the super pier, 600 feet in length, there were four bids, the lowest

being \$12,707.75, by Kerr & Walsh. The contracts will not be let until the bids are approved by the chief of engineers at Washington.

The city water-pipes are to be extended to the Soldiers' Home, about two miles west of Milwaukee. When the new high-service station on the west side is completed there will be a sufficient head of water to supply the Home without any loss of flow to consumers on the west side.

Pat Drew will pave Dock Street with cedar blocks for \$1.09 per square yard.

J. C. F. Brand will build the new intercepting sewer on Park Street, from Fifth Avenue to Muskego Avenue, for \$8.75 per foot in ordinary ground, and \$16 when he strikes quicksand or mud.

The Board of Public Works let the contract for the high-service pumping-station on the corner of Tenth Street and North Avenue, for \$31,400, September 13. John Kraatz was the successful bidder.

"The Mammoth Waukesha Mineral Spring Company" is the title of a new corporation which proposes to erect the works necessary to bring mineral water in pipes from Sussex to Milwaukee, twenty miles.

WATERBURY, CONN.—Informal estimates for constructing an iron bridge over the Naugatuck, at Bank Street, have been received by the Selectmen as follows: Berlin Iron Bridge Company, \$19,250; R. F. Shawkins Iron-Works, of Springfield, Mass., \$20,500; Wrought-Iron Bridge Company, of Canton, O., \$21,000. The Sunnyside Avenue bridge, intended to cross the meadow on to Riverside Street near the cemetery, to be 175 feet span and was to have a 24-foot roadway and two 5-foot sidewalks, was also estimated on. The bids of the several companies for this structure, including iron joists, were: Berlin Bridge Company, \$15,500; R. F. Shawkins Iron-Works, \$16,750, and Wrought-Iron Bridge Company, \$16,200. A special town meeting last week dropped the Sunnyside bridge, and voted that a committee of three (L. I. Munson, John L. Saxe, and John Fitzpatrick) prepare plans and estimates for Bank Street Bridge and report at a meeting called for September 21.

BROOKLYN, N. Y.—Contracts on the new building of the Arion Society were let last week as follows: Mason work, Jacob Rauth, \$23,900; carpenter work, J. Wagener, \$16,948; plumbing, George W. Coger, \$2,046; tin work, L. Goetting, \$800. Total, \$43,694. Steam-fitting, painting, etc., contracts have not yet been made.

CHICAGO.—A contract is awarded to A. Gottlieb & Co., Chicago, for the iron-work of a viaduct 369 feet long over the new Wisconsin Central Railroad tracks, and of an approach thereto 350 feet, both improvements being at the western approach to Twelfth Street Bridge which is now being replaced by a 4-track steam-swing bridge. For the substructure of the viaduct and approach, Joseph Downey has now about completed his \$50,000 contract, and the whole work will be finished December 1.

GOVERNMENT WORK.

SCHEDULE of proposals for constructing school-house on B Street, bet 12th and 13th Streets, N.E., opened September 15, 1886, by the Engineer Commissioner of the District of Columbia: C. Thomas, \$22,800; F. Baldwin, \$22,990.

SCHEDULE of proposals for construction of hospital at Washington Asylum, opened September 15, 1886, by the Engineer Commissioner of the District of Columbia: J. B. Halliday, \$3,295; C. Thomas, \$3,590.

ABSTRACT of proposals for dredging in channels leading to harbor at Baltimore, opened at 1:05 P. M., September 16, 1886: Elijah Brainard, New York, 13½ cents per cubic yard Brewerton channel, 26½¢ cut-off channel; Atlantic Dredging Company, Brooklyn, N. Y., 17½¢. Fort McHenry channel, 12½¢. Brewerton channel, 35¢ cut-off channel, 12½¢. Craighill channel; Morris & Cumings, New York, 12½¢. Brewerton channel, 14½¢. Fort McHenry channel; G. C. Fobes & Co., Baltimore, Md., 14½¢. Fort McHenry channel, 13¢. Brewerton channel, 10½¢. Craighill channel; National Dredging Company, Wilmington, Del., 15¢. Fort McHenry channel, 12¢. Brewerton channel, 28¢ cut-off channel, 10½¢. Craighill channel, 16½¢ for the whole work; Baltimore Dredging Company, Baltimore, Md., 13¢. Brewerton channel; American Dredging Company, Philadelphia, Pa., 13¢. for all the work; P. Sanford Ross, Jersey City, N. J., 10¢. Craighill

hill channel, 30¢. cut-off channel, 12¢. Brewerton channel, 14½¢. Fort McHenry channel, 15½¢. for all the work.

SCHEDULE of proposals for cast-iron water-mains, special castings, valves, and fire-hydrants, opened September 15, 1886, by the Engineer Commissioner of the District of Columbia:

Twenty-five Fire-Hydrants.	Price.	Twenty 6-inch 3-way Water-Gates.	Price.	Twenty 6-inch 4-way Water-Gates.	Price.	Sixty 6-inch 2-way Water-Gates.	Price.	Four 12-inch Water-Gates.	Price.	Three 30-inch Water-Gates.	Price.	50,000 pounds Special Castings.	Price.	35 Tons 3-inch Pipe.	Price.	4 Tons 4-inch Pipe.	Price.	20 Tons 6-inch Pipe.	Price.	300 Tons 20-inch Pipe.	Price.	Bidders.
.....	Boulder Iron Foundry, by L. Chafee, Treas.
.....	McNeal Pipe and Foundry Company.....
.....	Camden Iron Works.....
.....	John McClelland.....
.....	Viney & Baker.....

[For balance of Contracting News see Supplement.]

CONTRACTING INTELLIGENCE SUPPLEMENT

OF

THE SANITARY ENGINEER.

DEVOTED TO

ENGINEERING, ARCHITECTURE CONSTRUCTION, AND SANITATION.

A JOURNAL FOR THE ARCHITECT, ENGINEER, MECHANIC, AND MUNICIPAL OFFICER.

VOLUME 14.]

NEW YORK, SEPTEMBER 23, 1886.

[NUMBER 17.]

GOVERNMENT WORK.

(Continued from page 400.)

COLUMBUS, O.—Synopsis of bids for iron stairways for Court House, etc., opened September 13: Haugh, Ketcham & Co. Iron-Works, \$5,662.60; Marshall Foundry and Construction Co., \$7,500; The Harris & Winslow Co., \$5,400; Manley & Cooper M'fg Co., \$6,873; Penna. Construction Co., \$7,816; Snead & Co. Iron-Works, \$6,667.

LIST of bids received and opened September 14, 1886, by the Supervising Engineer and Architect of Fire-Proof Building, for material and labor, laying tile floor in new Pension Building:

BIDDERS.	Encaustic Tiles.	
	Per Sq. Ft.	For 56,240 Sq. Ft.
J. F. Manning & Co., Washington, D. C.	39c.	.....
Jas. H. McGill, Washington, D. C.	35½	.....
Mosaic Tile Co., New York	42½ & 47½	.....
Hayward & Hutchinson, Washington	43	.....
Starr Encaustic Tile Co., Pittsburg	40 & 45	.....
Miller & Coster, New York	.....	\$28,000
U. S. Encaustic Tile Co., Indianapolis	41	.....
Wm. Wilson & Sons, Philadelphia	.....	\$19,623
American Encaustic Tile Co., New York	41	.....
J. P. Robertson & Co., Washington	37½	.....
Shauplem & Watts, Philadelphia	.....	113,000
J. K. Bingham, New York	.....	125,000
Flanney Bros., Washington	.....	23,058.40
Richard Rothwell, Washington	43	.....

FOR MARBLE TILES.

BIDDERS.	Per Sq. Ft.	For 56,240 Sq. Ft.
Burlington M'fg Co., Chicago	40c.	.....
Sherman & Flavin, Chicago	.....	\$24,500
Flanney Bros., Washington	.....	30,625
Richard Rothwell, Washington	.....	.....
William Jardine, Washington	93	.....

* Imported and free of duty.

+ Imported and free of duty, base to be made by U. S.

SYNOPSIS of bids for steel lining tubes for rifle cannon, opened by R. Birnie, Jr., Ordnance Department, Washington, D. C., September 16, 1886: Midwell Steel Co., Philadelphia, Pa., 40c. per pound for hoops, and 35c. per pound for tubes. No other bid.

NORFOLK, VA.—The following bids for furnishing, building, and delivering a steam tender were received by Captain F. A. Hinman, Corps of Engineers, U. S. A., Norfolk, Va., September 14: Henry Brusstar and William S. Brusstar, Baltimore, Md., \$11,362; E. J. Codd & Co., Baltimore, Md., \$10,900; John C. Froehlich & Co., Baltimore, Md., \$12,750; H. A. Ramsay & Son, Baltimore, Md., \$13,000; C. Reeder & Sons, Baltimore, Md., \$11,845.

ABSTRACT of proposals for removing wreck of schooner "B. Oliphant" in Chesapeake Bay, opened September 7, 1886, by Col. William P. Craighill, U. S. Engineers, Baltimore, Md.: William M. French, Berkeley, Va., \$300; L. E. Broom, Baltimore, Md., \$945; Lewis & Talbott, Baltimore, Md., \$800; American Dredging Company, Philadelphia, Pa., \$900.

WASHINGTON, D. C.—Synopsis of bids for plumbing materials for State, War, and Navy Department Buildings, opened September 14:

BIDDERS.	Class D.	Class C.	Class B.	Class A.
Crook, Homer & Co., Baltimore	\$740.00	\$795.83	\$1,398.97	\$1,071.49
Fred. Adee & Co., New York	705.00	673.00	1,135.00	1,300.00
William Kirkup & Sons, Cincinnati	744.41	697.74	1,442.11	1,324.26
Myers Sanitary Depot, New York	619.58	731.36	1,064.45	1,378.90
J. L. Mott Iron-Works, New York	721.64	No bid.	1,250.41	No bid.
Thomas Somerville & Son, Washington	No bid.	664.33	1,190.45	1,339.98
Clendenen Bros., Baltimore	No bid.	700.97	No bid.	No bid.
M. Reynolds & Co., Brooklyn, N. Y.	850.00	620.30	1,590.70	1,077.00

BALTIMORE, MD.—Synopsis of bids for 50,000 (more or less) of roofing-slates, 10'x20"x¼", for Post-Office, etc., opened September 16: Eureka Slate Co., \$8.80 per 100; Washington Slate Co., \$7.96; Hartford Peach Bottom Slate M'fg Co., \$8.80; J. R. Williams & Co., \$5.88; William Williams, \$7.20, \$6.25, \$8.70.

POUGHKEEPSIE, N. Y.—Synopsis of bids for approaches, including excavation, grading, paving, stone fence, wall, and posts, and artificial stone sidewalks, for Post-Office, etc., opened September 6: Excavating, grading, paving, etc., James Power, \$3,536.

Artificial-stone sidewalks, James Power, \$1,300; Asher F. Meyer & Co., \$1,600; American Paving Co., 22 cents per square foot pul, granite, 18 cents per square foot sand.

LIST of bids received and opened September 14, 1886, for furnishing vault-lights for new Pension Building: F. N. Gray & Co., Washington, D. C., \$4,477.45, \$4,727, \$3,977.40; James H. McGill, Washington, D. C., \$3,189; Dauchy & Co., Chicago, Ill., \$2,550; J. A. Bolles & Co., Detroit, Mich., \$1,943.

BALTIMORE, MD.—Synopsis of bids for sheet copper, 2,900 sheets, 14-oz., 24x48 inches, tinned both sides, for Post-Office, etc., opened September 16, 1886: C. G. Hussey & Co., \$1.60 per sheet; Taunton Copper Manufacturing Company, \$1.60; Ansonia Brass and Copper Company, \$1.60; Balto. Copper Rolling Mill Company, \$1.60; New Bedford Copper Company, \$1.60; Detroit Copper and Brass Rolling Mill Company, \$1.60; Park Brothers & Company, \$1.60.

LIST of proposals received and opened September 14, 1886, by General M. Meigs, Supervising Engineer and Architect, for laying

asphalt pavement and furnishing and setting stone curbing in new Pension Building, Washington, D. C.:

BIDDERS.	Asphalt. Sq. Yd.	Curb.	
		Straight.	Circular.
J. P. Robertson & Co.	\$2.50	\$2.80	\$3.80 granite.
H. L. Atchison	2.50	.....	.....
Richard Rothwell	2.50	2.50	3.05 "
William Jardine	.....	1.75	2.30 "
Lane & Mainati	.....	3.05 granite.	.....
Flanney Bros.	.....	2.75 Ohio stone.	.....
		\$1,220 for all, granite.	

LIST of proposals received and opened September 14, 1886, for furnishing and setting in place stone steps in new Pension Building:

BIDDERS.	Ohio Stone.	Granite.
Flanney Bros., Washington, D. C.	\$390.00	.....
Richard Rothwell, "	315.00	\$785.00
William Jardine, "	.....	634.61
Lane & Mainati, "	395.60	673.79

Awarded to Richard Rothwell at \$335; Ohio stone.

SCHEDULE of proposals for repairing Anacosta Bridge, opened September 15, 1886, by the Engineer Commissioners of the District of Columbia:

Total.	Cost.	Price.
Florida pine wheel-guards, 7,578 feet.	\$3,710.09	\$41.00
	371.10	45.00
	4882.86	46.00
	3,000.49	265.23
	3,793.61	
White pine joist six inches wide, 4,032 feet.	\$133.05	\$33.00
	171.16	42.50
	157.24	39.00
	129.02	32.00
White pine joist four inches thick, 26,880 feet.	\$887.04	\$33.00
	1,142.30	42.50
	1,007.73	37.00
	860.16	32.00
White oak flooring three inches thick, 75,800 feet.	\$1,349.00	\$11.00
	3,227.50	42.50
	2,386.94	31.40
	2,539.20	33.50

BIDDERS.	Cost.	Price.
G. Cumberland
J. H. Atchison
F. Baldwin
J. T. Summers

SYRACUSE, N. Y.—Synopsis of bids for plastering Post-Office, etc., opened September 11, 1886: Vidler & Ayling, \$7,660; John Moore, \$10,016; Smith & Crimp, \$4,782; E. Austin, \$6,511; Hy. F. Crawford, \$6,973; Charles & L. Menick, \$9,000; Joseph Eastman, \$4,700.

COLUMBUS, O.—Synopsis of bids for plastering Court House, etc., opened September 6, 1886: Guillick & Co., \$6,978.40; O. P. Carlisle, \$6,663; Albert Perrin & J. J. Lee, \$10,963; Smith & Crimp, \$3,500; Edmund Austin, Jr., \$5,395; Weber Brothers, \$5,948; Joseph Eastman, \$3,966.

FRANKFORT, KY.—Synopsis of bids for joiner's work, wood flooring, stairways, fitting hardware, glazing, priming, painting, polishing, oiling and finishing for Court House, etc., opened September 8, 1886: John Mitchell, \$9,414; Miner & Furnell, \$9,720; Robert Mitchell Fur. Co., \$10,294.

LIST of proposals received and opened September 16, 1886, by the Supervising Engineer and Architect for 1,620.43 square feet of marble for coping in the new Pension Building, according to terms of specification and advertisement dated August 17, 1886: F. F. Manning & Co., Washington, D. C., \$1,256.34 Italian, \$1,358.38 Vermont blue, \$1,490.79 Tennessee; Flanney Bros., Washington, D. C., \$1,100 Vermont, Lee, etc.; Burlington Manufacturing Co., Chicago, Ill., \$1,335 Florentine; Sherman & Flavin, Chicago, Ill., \$1,450 Florentine Florence; Richard Rothwell, Washington, D. C., \$998.53 Italian, \$1,340 Tennessee, \$1,410 Rutland; William Jardine, Washington, D. C., \$1,134.30 Vermont; Thomas Heany, Washington, D. C., \$1,267 Italian, \$1,498 Tennessee. Awarded to Richard Rothwell at \$998.53 for Italian marble.

MISCELLANEOUS.

MINNEAPOLIS, MINN., City Council on September 10 resolved that all sewers to be constructed in 1887 be by men employed by the day, under direction of the City Engineer and the Committee on Sewers, that \$1.50 be the minimum price for unskilled labor, with nine hours a day's work.

NEW YORK CITY.—The Commissioner of Public Works has served notice on Contractor Baird, who is paving the Fifth Avenue in this city, suspending work on the pavement.

THE Automatic Delivery Company, capital \$500,000, has filed articles of incorporation. The company proposes to lay pneumatic tubes for transmission of parcels, etc., in this city. Among the incorporators are: Roscoe Conkling, Isaac H. Bailey, and Louis W. Frost.

PUTNAM MONUMENT.—The Monument Commission has accepted the design of Karl Gerhardt, of Hartford, for the \$10,000 statue in memory of General Israel Putnam.

LATE NEW YORK BUILDINGS.

46 Mulberry st, br flat; cost, \$16,000; o, Carmine Caro; a, J. McIntyre.

8th av, n w cor 144th st, br flat; cost, \$18,000; o and b, John Donnallan & Sons; a, J. H. Valentine.

8th av, w s, 24.11 n 144th st, 3 br tens; cost, each, \$13,000; o and b, John Donnallan & Sons; a, J. H. Valentine.

157th st, n s, 100 w St. Nicholas av, stable and dwell; o, Samuel Galle, lessee; a, C. Pfeiffer.

Pier 27, E. R., frame freight-shed office; cost, \$10,000; o, B. & O. R. R., lessee.

1st av, s e cor 55th st, 4 br flats; cost, total, \$70,000; o, R. Rilsner; a, Thom & Wilson; b, G. W. Inlefried.

Association News.

THE AMERICAN SOCIETY OF CIVIL ENGINEERS held its mid-month meeting on the evening of the 15th. The paper of the evening was by John W. Hill, M. Am. Soc. C. E., entitled "A Masonry Dam," and gave a description with full illustrations of the dam of the Eden Reservoir. A mathematical analysis of its stability under various conditions was made, and a critical examination of the structural design, pointing out its defects and suggesting remedies. The paper was lengthy and cannot be intelligently abstracted without a copy of the text.

AMERICAN INSTITUTE FAIR.—The fifty-fifth annual fair will open in the city of New York on September 29. The horticultural display will begin October 6.

CHICAGO MASTER PLUMBERS.—The association met September 15, President T. C. Boyd in the chair, and thirty other members present. A letter from Ottawa, Province of Ontario, Canada, announced the formation of an association of masters there, and the requested copy of the Chicago constitution and by-laws was ordered sent. G. Franklin, of Ravenswood, was posted for membership, and Mr. Sherman, of Sherman & Bennett, was elected. An amendment to the constitution was carried, on motion of Vice-President Griffith, giving full control of the finances to the treasurer. On motion of Edward Baggot, seconded by Hugh Watt, \$75 was donated to the Charleston sufferers by earthquake, and \$25 to the Texas sufferers by drought.

PHILADELPHIA MASTER PLUMBERS.—The regular monthly meeting of the Master Plumbers' Association was held September 10, W. W. Mentzinger presiding and Enoch Remick Secretary. After the reading of the minutes of the last meeting the committees reported some unimportant business, and then the real business of the meeting was brought in the report of the Board of Directors relative to the injunction case against the Board of Health. The case has been keeping the plumbers on the *qui vive* to know what the effect of the suit would be. The Board reported that the court had granted a temporary injunction, which is to stand until further notice of the court, restraining Mr. Blabon from violating the rules of the Board of Health, although he had permission from the board to do so, and this after a most exhaustive argument by counsel for the defendant. The result of the case was received by all the members present with the utmost satisfaction, and the feeling was very strongly set forth that if an appeal should be taken the Board of Directors should continue the fight, and they were directed so to do. It is plainly discernible that the majority of the plumbers feel that this is a most important case, and must decide whether the Board of Health has the autocratic power to change these rules at pleasure, or they must give the notice required by law. It was reported that a meeting had been held of representatives of the plasterers, painters, and carpenters of the city, and that the plumbers had also been invited to attend, but, owing to delay, had not received the notice to oppose the general clause in the specifications as drawn by many architects that the work must be done to the satisfaction of the architect, and that no appeal could be made from his decision. It was agreed that a representation of the association should attend, and for that purpose a committee of five was appointed to attend the next meeting. It was stated by several members that cases of violation of the rules of the Health Board had come under the notice of the members, and each case was referred to the Board of Directors, with power to act. In the injunction case against a well-known material man who owns the building occupied by the association, and who had contemplated tearing down the building, although the association held an unexpired lease, it was stated the injunction had been granted, but the owner had determined that he would not demolish the building for a few years more, and so the case had been settled. The majority of the evening was devoted to a discussion of the Board of Health injunction, and then the association adjourned.

PERSONAL.

DR. W. W. JACKSON, physician to the New York City Prison, and long medical examiner in the Department of Charities, died September 14.

SEABURY S. GOULD, President of the Gould's Manufacturing Company, of Seneca Falls,

N. Y., died at Watch Hill, R. I., September 4, in the seventy-fifth year of his age. Mr. Gould was born in Sharon, Conn., in 1812. In 1852, with Abel Downs, he formed the firm known as Downs & Co., for the manufacture of pumps. In 1864-65 Mr. Downs withdrew. Mr. Gould's sons came into the business and the present firm name was adopted. Mr. Gould was a man of influence and public spirit in his community.

We have to note the recent death of James Flower, senior member of the firm of James Flower & Bros., founders and machinists, in Detroit, Mich. Mr. Flower was born in Winchester, Eng., in 1818, went to Detroit forty-two years ago, and in 1853 organized the firm of Flower & Bros.

THE Mayor of Charleston, S. C., has appointed a committee, with Captain W. H. Bixby, U. S. A., Chairman, to examine and report on buildings damaged by the earthquake.

NEW CATALOGUES.

We have received an artistically gotten-up pamphlet illustrating a variety of buildings and interiors, designed by Mr. Harry L. Page, architect, of Washington, D. C.

We have received a copy of the new catalogue of the William S. Cooper Brass-Works, No. 259 North Broad Street, Philadelphia, illustrating the various types of water-closets and sanitary specialties manufactured by them.

M. MAHONY, of New York and Troy, has issued a descriptive pamphlet of the Mahony Boiler for steam and hot-water heating, with instructions for piping, and in which is also given a series of plans illustrating his system.

We have received the supplement to the 1886 catalogue of Thomas Maddock & Sons, Trenton, N. J. (W. W. Perrine, Manager, 273 Pearl Street, New York), illustrating the plumbing and sanitary earthenware, also druggists' and chemical apparatus manufactured by them.

Patents.

348,187. Non-conducting pipe-covering. Robert Burns, Chicago, Ill., assignor of one-half to Edwin S. Skinner, same place. Filed June 26, 1886. (No model.) An improved article of manufacture, a non-conducting covering consisting of a body of a fibrous or other loose material inclosed in a casing that is provided with a series of V-shaped channels or depressions.

348,215. Steam-actuated valve. William H. Hughes and Robert Hughes, Cleveland, O. Filed December 24, 1885. (No model.)

348,247. Steam-heater. Benjamin A. Stevens, Toledo, O. Filed December 28, 1885. (No model.)

348,256. Wind-mill. Edward Williams, Dubuque, Iowa. Filed September 29, 1885. (No model.)

348,266. Hydraulic gate or water-regulator. Cecil H. Colquhoun, St. Andrew's Bay, Fla. Filed July 8, 1886. (No model.)

348,277. Rotary water-meter. Franklin T. Gilbert, Walla Walla, Wash. Filed November 14, 1885. (No model.)

348,312. Spring-hinge. Lorenz Bommer, New York, N. Y. Filed December 30, 1885. (Model.)

348,315. Steam-boiler. Francis O. Burrows, Cleveland, O. Filed February 23, 1886. (No model.)

348,364. Ball-cock. Henry C. Weeden, Boston, Mass. Filed April 7, 1886. (No model.)

Claim.—In a ball-cock, the combination of the water-inlet A, water-outlet B, sliding double-faced valve C C', the circular guide D, provided with a packing C², at its inner face, the ball E, lever E', strap E², said lever being pivoted to the said strap, the post E³, around which said strap is free to turn, the said post extending from the said guide D, the nut E⁴, clamping the strap upon the post, and the abutment F, carried upon the said lever and abutting against the said valve to close the same, all substantially as herein set forth, and for the purposes herein specified.

348,404. Refrigerator. Frank A. Masters, Troy, N. Y. Filed July 1, 1886. (No model.)

348,443. Manufacture of ornamental brick from clays of different colors. James C. Anderson, Highland Park, Ill. Filed November 20, 1885. (No model.)

Claim.—1. A brick made of two or more kinds of clay arranged in layers and pressed into compact form while in a dry state, which, when burned, will present layers of different colors, as set forth.

2. A brick made of clay of two different kinds, the face layer being of a better quality of clay than the main body of the brick, both clays being united or pressed into form while in a dry and finely-powdered condition.

348,492. Apparatus for preparing asphaltic concrete for paving purposes. Francis V. Greene, New York, N. Y., assignor to the Barber Asphalt Paving Company, Washington, D. C. Filed May 21, 1886. (No model.)

Claim.—1. A plant for the preparation of asphaltic concrete for paving purposes, consisting of a boat having the heating, mixing, and melting devices mounted thereon in substantially the manner described, and for the purpose set forth.

2. A plan of the manufacture of asphaltic concrete for paving purposes, consisting of a boat with propellers and engine for driving the same and the heater and mixer adapted to be driven by the same engine, as set forth.

348,530. Boiler-cleaner. James Millar and George Feeny, Amabel, Ontario, Canada. Filed November 11, 1885. (No model.)

Claim.—1. A boiler-cleaner consisting, essentially, of a rod, *a*, carrying fixed lugs, *c c'*, a block, *b*, and a head-block, *c*, carrying splints or wires, substantially as described, and for the purpose specified.

2. The combination, with a boiler, of a cleaner consisting, essentially, of a brush hinged to a block loosely mounted on a rod between two fixed lugs, substantially as and for the purpose specified.

3. The combination, with a boiler, of a brush hinged on a block loosely mounted on a rod between two lugs that are fixed to a rod at right angles the one to the other, such rod passing through a packing-box, and the head-block of the brush being provided with small wheels, as *n*, substantially as described, and for the purpose specified.

ANNOUNCEMENT.

The publication of the sixth revised edition of the U. S. Pharmacopoeia (1880), containing as it does much more strict requirements for the purity and strength of pharmaceutical preparations, has been followed in some States of the Union by the enactment of laws against the adulteration of drugs, which laws make the Pharmacopoeia the official standard.

In accordance with our established policy we shall, as in the past, use our best endeavors to furnish only such preparations as shall meet pharmacopoeial requirements. We are heartily in sympathy with all efforts which aim to improve the quality of medicines, and shall continue as heretofore to use our influence to promote the sale and use of pure drugs and medical preparations.

W. H. SCHIEFFELIN & CO.

New York:
175 WILLIAM STREET

Paints.

ANNOUNCEMENT.

WE desire to call attention of consumers to the fact that we guarantee our ready-mixed paints to be made only of pure linseed-oil and the most permanent pigments. They are not "Chemical," "Rubber," "Patent," or "Fire-proof." We use no secret or patent method in manufacturing them by which benzine and water are made to serve the purpose of pure linseed-oil. Sample cards containing 50 desirable shades sent on application.

F. W. DEVOE & CO.,

FULTON ST., COR. WILLIAM, Established 1852,
NEW YORK. ARTISTS' MATERIALS
FINE VARNISHES.

LIEBIG COMPANY'S EXTRACT

OF MEAT. Finest and cheapest Meat Flavoring Stock for Soups, Made Dishes, and Sauces. Annual sale 8,000,000 jars.

LIEBIG COMPANY'S EXTRACT

OF MEAT. An invaluable tonic. "Is a success and a boon for which nations should feel grateful."—See "Medical Press," "Lancet," etc.

Genuine only with the fac-simile of Baron Liebig's Signature in Blue Ink across the Label. The title "Baron Liebig" and photograph having been largely used by dealers with no connection with Baron Liebig, the public are informed that the Liebig Company alone can offer the article with Baron Liebig's guarantee of genuineness.

LIEBIG COMPANY'S EXTRACT

OF MEAT. To be had of all storekeepers, Grocers, and Chemists. Sole Agents for the United States (wholesale only) C. David & Co., 9 Fenchurch Avenue, London, England.

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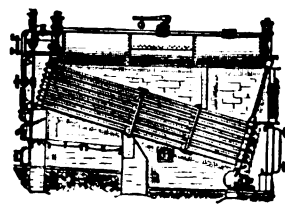
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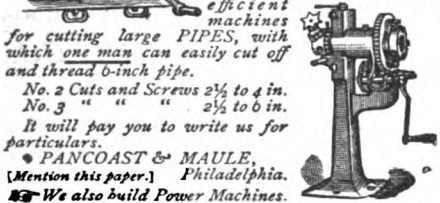
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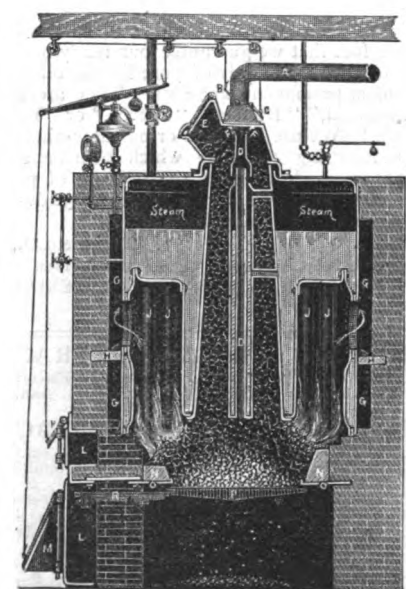
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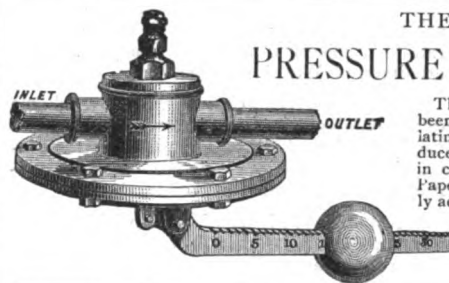
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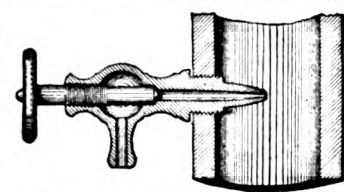
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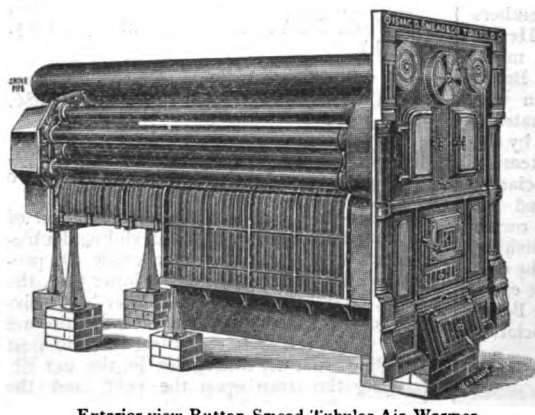
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THE ST. LAWRENCE QUARANTINE.

AT this time of year most people feel very little interest in quarantine matters. They consider that the danger of the introduction of cholera or yellow fever is over for the season, and that as regards other diseases quarantine is not of much importance. Nevertheless, it is in time of peace that one can best prepare for war, and it is during the winter season that arrangements must be made for improving the next summer's work in the way of maritime sanitary inspection and quarantine. Of the importance to the United States that a proper system of maritime inspection and quarantine should be maintained on the St. Lawrence River, no one who knows anything of the matter and of the history of the introduction of cholera and small-pox into this country through that channel can have any doubt.

We regret to be compelled to add that it is equally certain that no such system has been maintained on the St. Lawrence, that the laws and regulations are insufficient to insure protection, and that even those which exist have not been enforced. The evidence that this is the case is contained in a report recently made by Dr. P. H. Bryce, the Secretary of the Provincial Board of Health, Ontario, upon the quarantine system of the St. Lawrence, which report has been approved and adopted by the Provincial Board of Health.

At the Washington Conference of State Boards of Health in 1885, Dr. Montizambert, the Quarantine Officer at Grosse Isle on the St. Lawrence, reported that he was authorized by the department to say that improvements should be made, and in particular that the regulations should be enforced with regard to the medical inspection of all inward-bound vessels at Grosse Isle, except the mail steamers, which are to be inspected at Rimouski; that the evidence of ship-masters and surgeons shall be required to be given under oath, and that all vessels shall be required to enforce vaccination of every unprotected person on them, whether passenger or employee.

The report of Dr. Bryce shows clearly that these promises have not been kept, that there is practically no inspection of the mail steamers at Rimouski, that affidavits have not been required, and that small-pox has been imported during the last summer without any precautions as to vaccination being enforced in the vessel.

We are very glad to see the Provincial Board of Health of Ontario taking this matter up, and it is to be hoped that the Department of Agriculture, which has charge of this matter, will see the necessity for keeping its promises, and will make the necessary arrangements this winter for so doing.

If it does not do this we predict that there is grave trouble in store for it in the near future.

THE ELECTROLYSIS OF SEWER-GAS.

WHEN an ingenious man who knows nothing about sewer-gases sets to work to devise a plan

for their disposal the result is often something new, even if it is not useful. This is the case as regards a recent English invention called a sewer-gas destructor, in which a combination of a rotary fan, a glass-lined box, some tin-foil, a dynamo, a gas-engine, and some connecting pipes and wires is intended to decompose the sulphureted hydrogen and manufacture ozone out of sewer-gas. Several years ago another inventor also proposed to destroy sewer-gas and manufacture ozone by producing electric-sparks throughout the system of sewers, but his plan did not take, possibly because he did not provide machinery enough. This objection will perhaps not apply to the combination above referred to, which is certainly new, yet it would seem as if some additions could be made to it with advantage, such as a steam-atomizer, a few Bunsen's burners, and a reverberatory furnace. Moreover, some useful applications should be made of the valuable products which the inventor may hope to obtain from his electrolyzed gases: he might, for instance, use them in nickel-plating, or in the preparation of worm lozenges, or make them the basis of a new hair-dye.

The possibilities of electrolyzed matters are almost infinite, and it is to be hoped that the process will be extended; for instance, we should like to see what the result would be of electrolyzing a few "jerry builders" or some of our professional demagogues, or one or two samples of the self-constituted sanitary advisers and devisers who afflict the suffering public with their essays and inventions. Like our grandmother's mustard-plaster, the trial could do no harm even if it did no good.

PRESS dispatches intimating that defective plumbing in the U. S. Treasury Building was the cause of the physical breakdown of Secretary Manning, we instituted inquiries. The information we have received would lead us to believe that the conditions existing were a contributory, if not the sole cause of this administration losing the services of one of its ablest members. A description and sketch of the condition of the plumbing in the Secretary's private room will be found elsewhere.

THE valuable report of the United States engineers and inspectors to the Mayor of Charleston, stating the results of inspections of buildings after the earthquake, is given almost entire elsewhere in this issue. It shows the value of honest building even among earthquakes. Without exception, those buildings which suffered most were those in which the workmanship had been skinned. Charleston offers a most forcible commentary on the effect of "Buddensieck" building.

CRUDITY IN SANITARY LEGISLATION.

IN this era of sanitary reform disappointment is frequently felt by sanitarians at the practical results of so-called "sanitary legislation," enacted through their well-intended instrumentality.

The statute, ordinance, or health board regulation, which to a health officer presents no difficulty in enforcement, is occasionally found, when subjected to the test of judicial interpretation, to be inoperative; if a statute it is in violation of some established constitutional provision, or if an ordinance or health board regulation it is inconsistent with some existing statute, and in either event efforts for reform prove abortive.

This difficulty arises from the crudeness in the phraseology of the law or from ignorance of constitutional inhibitions.

The evils to be eradicated, and, in a general way, the remedies necessary, should be known to sanitarians, and recommendations in these regards emanate properly from them; but the accurate and successful framing of remedial legislation is the province of a trained lawyer. His familiarity with the existing laws upon the subject, the constitutional limitations upon State legislation and statutory powers of municipalities and health boards, enable him to safely pilot the sanitarian over these dangerous shoals.

OUR BRITISH CORRESPONDENCE.

The Anti-Vaccination Movement in Leicester—Mr. William Westgarth on the Reconstruction of the Poorer Neighborhoods of London—Lodgings and Kitchens for Working Women.

LONDON, September 11, 1886.

THE city of Leicester is attaining notoriety in connection with its anti-vaccination position. It is reported that only twenty per cent. of the children born during the past twelve months have been vaccinated, and that the sympathy with the movement affects some 10,000 inhabitants. The worst feature is, that the local authorities have discontinued to insist on the carrying out of the law. The supineness of the Local Government Board in not altering such a scandal is astonishing, and it is certainly not to be borne, that a local authority, established to carry out the provisions of the law, should, by sympathy with those at variance therewith, defeat the public objects of the legislation.

Mr. William Westgarth has made a contribution toward the problem of reconstruction of the poorer neighborhoods of London, in the shape of an essay read before the British

Municipal authorities should have the right of disposing the trust of their property after thirty-five years, in order that the movement should take a national character.

A second essay by Mr. Westgarth was a suggestion for dealing with the class of female laborers in London whose earnings are insufficient. Taking the fact that there are on an estimate 250,000 individuals in the east end of London whose earnings by needle-work are only 1s. (24 cents) per day—6s. (\$1.44) per week—and that under the existing state of things they could not possibly live on the amount respectably, he proposed to deal with the difficulty by an extension of the system of separate beds and common kitchen. His idea was a quadrangular building, having the inner court roofed with glass to form a hall or common living-room. In connection with this hall staircases and balconies would lead to the several floors, where the space should be conveniently arranged into cubicles just large enough for sleeping purposes. The house should be under the charge of a master and matron, assisted by visiting committees of ladies. The most convenient number of inmates to deal with under the proposed circumstances to render the matter a paying concern would be 1,000 to 3,000. Good wholesome food could be provided to each



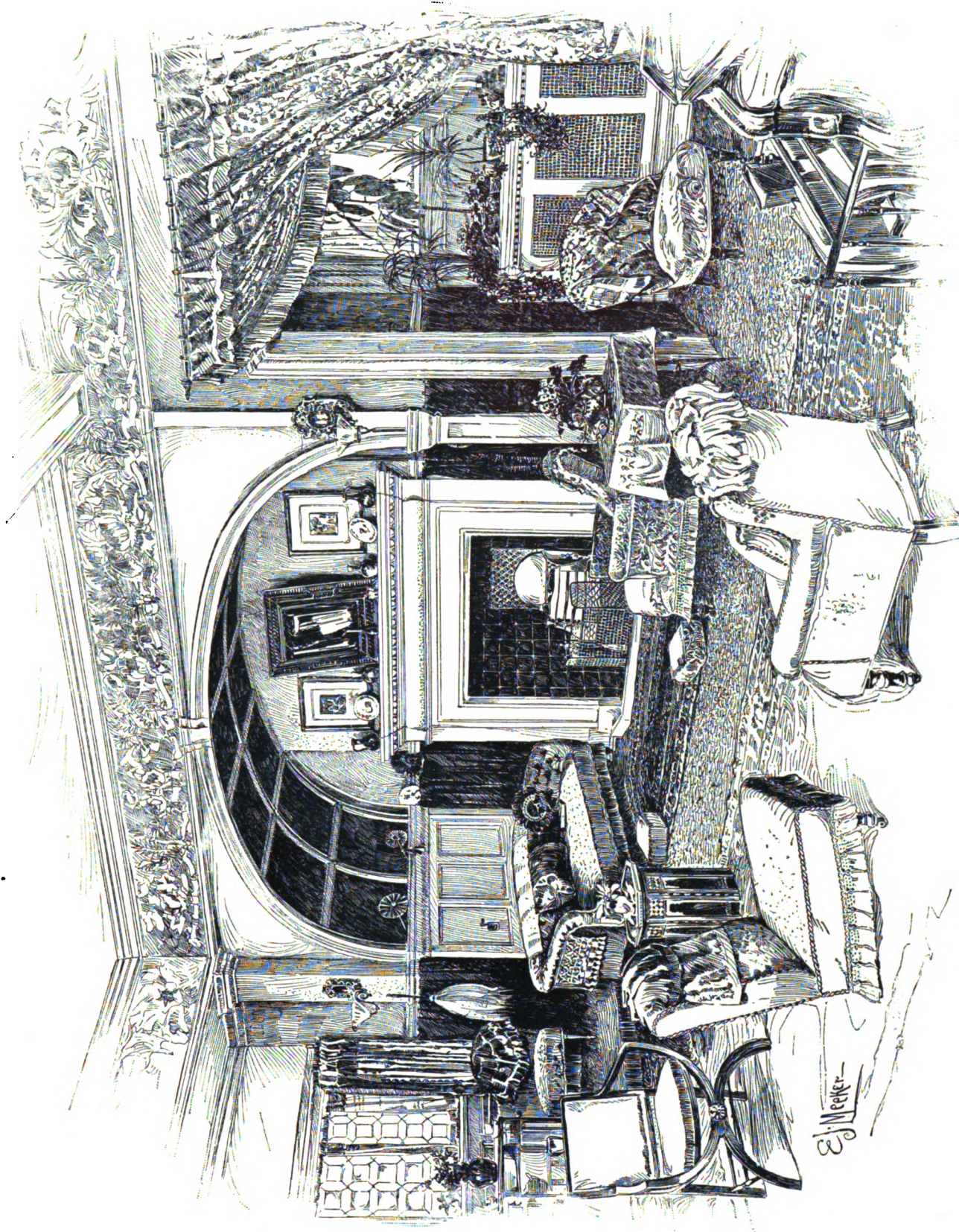
A RESIDENCE AT CAMBRIDGE, MASS.—W. R. EMERSON, ARCHITECT.

Legislation, like physic, is more effective in small than in large quantities. If an evil appears in the body politic, social or sanitary, we are too apt to assume that the sovereign panacea is more legislation, and that when a new law is passed intended to remedy the evil, thereupon the evil is immediately cured or disappears. It is well when the evil is pronounced to examine the existing laws; it may be that the remedy is already there, and that the law which contains it is, like the sword hung up, rusty for want of use. If the necessity be a new one, then, possibly a slight amendment to some law already upon the statute-book will accomplish the desired result, unless the subject be so comprehensive in its scope as to demand a more extensive and special enactment. Were such legislation, as it should be, the outgrowth of the intelligent co-operative efforts of sanitarians and lawyers, freed from demagoguery, there would be fewer farcical enactments like the Tenement-house Cigar Act and much of the oleomargarine legislation.

Association on the 8th inst. The basis is unquestionably good, in so far as he contemplates the question of reconstruction simply as a commercial enterprise, and from a business point of view. Referring to the reconstruction of Paris, the cost of which was about eighty millions, and the result to the public a debt of fifty-five millions, he explained the deficit by the fact that after the streets had been realigned and the sewerage system constructed the authorities disposed of the rights to the highest bidder. The subsequent rise of site values has been enormous (more than treble), and the buyers, of course, reaped the benefit. For the consideration of the matter as a proper business enterprise, he laid down three points for consideration: (1) The natural increase in value; (2) value increase by improvement; (3) economic financiering in carrying out the scheme. He proposed a joint stock company, with special powers under Act of Parliament, and a large nominal capital—say ten millions—of which only one-tenth should be called up, the balance standing as liability. On this nominal capital it would be possible to raise funds by loan, while the dividends on the paid-up portion of the capital would be relatively large,

inmate at a cost of 2d. (4 cents) per diem, the sleeping berths would cost 9d. (18 cents) weekly, the use of the hall, inclusive of lighting, warming, and interest on capital, etc., would be 2s. 6d. (60 cents) weekly. There would have to be an additional charge of 1d. or 2d. for a minimum of furnishing, which would be fixtures, and an entrance payment of 5s. or 10s. toward a redemption fund, which would accrue with the weekly payments, and after a term of (say) twenty years would give the inmate a proprietary right. Mr. Westgarth announced that he, in conjunction with the late Sir George Hodgkinson and Mr. Samuel Morley, was erecting a building on the plan sketched in Chenies Street, Tottenham Court Road, to accommodate 380. The cost of such a building would be 4d. (8 cents) to 6d. (12 cents) per cubic foot, according to the number for which it was intended. However sound the scheme may have been, the essayist omitted to reckon on the prejudice existing in the poorer classes in the inverse ratio to their social standing against anything like regulation or barrack life.

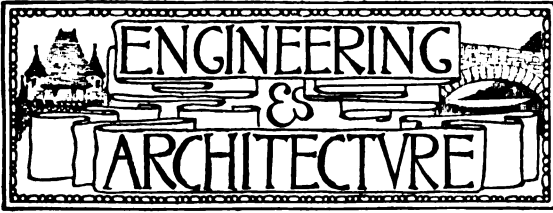
SAFETY-VALVE.



THE SANITARY ENGINEER ILLUSTRATED SERIES.

AN INTERIOR, FROGNAL PRIORY, ENGLAND.

R. NORMAN SHAW, ARCHITECT.



OUR SPECIAL ILLUSTRATION.

INTERIOR, FROGNAL PRIORY.—R. NORMAN SHAW, ARCHITECT.

WE this week show an interior at Frognal Priory, designed by Mr. R. Norman Shaw, F. R. I. B. A.

OUR ILLUSTRATION OF A MODERATE-COST HOUSE.

A RESIDENCE AT CAMBRIDGE, MASS.—W. R. EMERSON, ARCHITECT.

OUR vignette illustration this week is a view of the residence of Charles E. Wentworth, Esq., at Cambridge, Mass. The hall of the house is finished in ash, the parlor is of painted pine, and the dining-room and library of stained whitewood. The rest of the finish is white pine. The cost of the house was \$9,500. The architect is Mr. W. R. Emerson, of Boston, Mass.

WATER PURIFICATION.

No. I.

THE present condition of our knowledge of the nature of the dangerous impurities in a water-supply, of means for detecting these impurities and estimating their amount, and of the relative efficiency of the various means which have been proposed for freeing the water from these impurities, is very unsatisfactory. We find the most eminent chemical and biological authorities differing widely in opinion upon all these points—so widely that it would at first seem as if there had been really no substantial advance in our knowledge of these subjects. At the close of a discussion in the Institution of Civil Engineers upon a paper on "Water Purification," by Dr. Frankland, read last April, the President, Sir Frederick Bramwell, complained that "it had been left an open question as to whether the organisms did any harm, whether if some were harmful others were not innocent, whether there were not some organisms which destroyed others, and whether it would not be well to leave the destroyers in the water so that they might destroy. Nobody knew which were the bad and which were the good, or whether the bad would eat up the good or the good eat up the bad. The paper and the discussion were enough to cause great alarm by showing the danger of drinking polluted water, but having excited this alarm he could not find that any remedy was agreed on by which that alarm might be satisfactorily allayed."

The case is certainly not so bad as Sir Frederick puts it, for although some of his problems have not yet been answered they are in a fair way to be answered; in fact, the possibility of stating them definitely is a long step toward their solution. The experimental methods by which alone these questions can be settled require much time, special apparatus, and skilled observers. Dr. Frankland made use of the gelatin-plate culture process of Dr. Koch in testing the efficacy of various filtration, precipitation, or other processes of removing minute organisms from water, but, so far as can be judged from his paper, he may not have taken into sufficient account certain difficulties and fallacies connected with such cultures, nor did he have specially in view the most important object for which such cultures should be made.

In the first place, all ordinary drinking-water contains micro-organisms, and these organisms when taken into the stomach are, as a rule, perfectly harmless. The intestinal canal of an average healthy man contains more micro-organisms than a thousand gallons of average river-water.

In the second place, the number of micro-organisms which a given sample of water contains depends on the time during which it has remained comparatively motionless, on the temperature and amount of light to which it has been exposed, and on the amount of matter suitable for the nutriment of organisms which it contains. In comparing different waters by a gelatin or other culture method, these factors must be taken into account if the work is to have any value. Moreover, a single culture test by the gelatin plate is of little importance—at least, half a dozen such cultures for each sample are required to give a fair average.

Some micro-organisms will not multiply in gelatin, but will flourish on other culture media, and, as regards those micro-organisms which produce specific diseases, their rapidity of multiplication under favorable circumstances is so great that whether there are three or three thousand in a cubic centimeter of water is of much less importance than is the proportion of a chemical poison present.

What, then, it may be asked, is the use of the so-called biological methods of water examination? The answer is, first, that it confirms the result of chemical analysis in indicating the probability of sewage pollution in a given sample, and thus leading to research for the causes of such pollution. Sewage pollution, to the extent in which it is usually found to exist in village wells and in streams contaminated by sewage, does not usually produce definite and marked injury to health in those using it, but it is liable to do so at any time—and it is pretty certain to do so at some time—hence we consider it as always dangerous in drinking-water. The second and most important object of the culture method of water analysis is to determine the presence or absence of those micro-organisms which produce disease—the pathogenetic bacteria as they are called. While there is yet much to do in this direction, more progress has been made than Sir Frederick Bramwell seems to suppose, and a dozen or more of these specific pathogenetic bacteria can now be recognized with great certainty by a combination of culture methods. The tendency of the experiments on this subject which are now in progress is by no means to create unnecessary alarm, but, on the contrary, to allay it.

It is unnecessary to point out the bearing of all this upon the question of the best means of water purification. Until we have settled as to what it is in water which makes it dangerous, and have learned to recognize its presence, attempts to get rid of or to destroy it are for the most part only groping in the dark. In our next number we will consider some of the practical applications of our present knowledge of micro-organisms to methods of water purification, and indicate some of the directions in which further research and experiment are most urgently needed.

(TO BE CONTINUED.)

RECENT WATER-WORKS CONSTRUCTION.

No. VII*.

WATERTOWN, MASS.

THIS town is in Middlesex County, on the line of the Fitchburg Railroad, about eight miles from Boston. It has a population of something over 6,000, made up of mechanics, mill hands, Boston business men, and the proprietors of the various manufacturing establishments which form the principal business interests of the town.

Construction upon the present works was begun in September, 1884, from plans prepared by the officers of the company, with William Wheeler, C. E., of Boston, as supervising engineer.

The source of supply is found in the ground-water of the gravel beds forming the north bank of the Charles River, and the collecting galleries are wholly subterranean. The accompanying illustration shows the arrangement of these galleries. The 8-foot collecting gallery runs parallel with the river, at a distance of some 200 feet, and there is no connection between the galleries and the stream. The pump-

gether with the necessary boilers, coal-sheds, tool-rooms, and a house for the superintendent.

The larger of the two pumps is a 1,000,000-gallon compound condensing-engine, 12x22x10x18 inches, while the smaller is described as a 500,000-gallon duplex engine (which is condensing or non-condensing at the pleasure of the engineer) 12x7x10 inches.

There are about eighteen miles of cement-lined sheet-iron mains, of sizes from 4 to 14 inches. The water is pumped through some two miles of 14-inch pipe, to a wrought-iron tank on the top of White's Hill, 40 feet in diameter, and of the same height. The first five sheets from the bottom are of 3/8-inch and the three upper of a 1/2-inch plate, and the structure is covered by a ventilator roof, protected by a wire netting.

The bottom of the tank is 167 feet above the centre line of the pumps, and the average pressure on Main Street is 90 pounds per square inch.

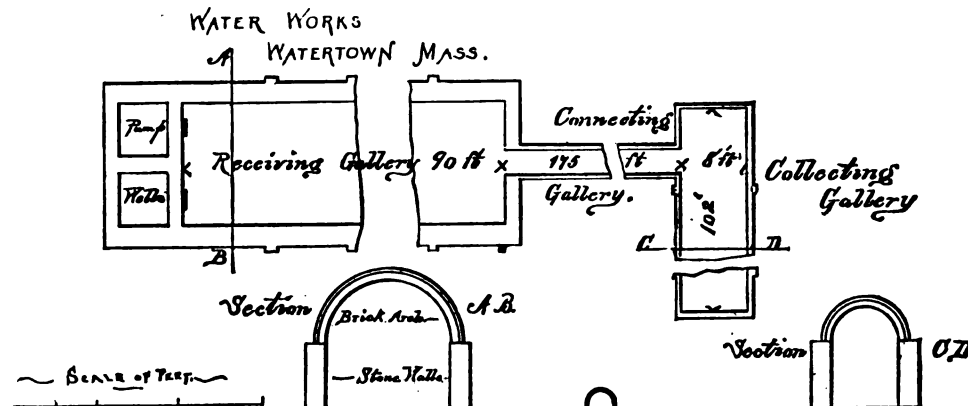
There are 164 hydrants, 184 stop-gates, and at present writing about 600 service-taps, which will probably increase to 700 before cold weather. The present consumption is about 150,000 gallons per day. Enamelled iron pipe is used for services.

The officers of the company are: A. O. Davidson, president; J. H. Perkins, Superintendent; J. H. Conant, Treasurer.

THE SEVERN TUNNEL.

FROM an occasional correspondent we have received the following details respecting the tunnel recently completed under the River Severn, which was opened to traffic on the first of this month. Experimental trains have been run through it during the past year, but it was thought best to complete it in all details and insure perfect safety before throwing it into use. The tunnel materially shortens the route from London to Bristol and the mineral region of South Wales, and avoids the long and disagreeable crossing by ferry. The river here is 2 1/2 miles wide, and the length of the tunnel 4 1/4 miles, it being about the same as that of the Hoosac tunnel, and a mile less than the Arlberg. The open cuttings at the ends measure 4 1/2 miles additional. The promoters are the Great Western Railway Company, and the total cost has been not far short of \$10,000,000. The original design was by Mr. Charles Richardson, a pupil of Brunels, Mr. (now Sir) John Hawkley being consulting engineer.

Work began in 1873, and during the next six years a number of shafts were sunk, there being eleven in all, and headings 7x7 feet were run for some distance to test the ground. There is a line of ugly rocks in the river on the line of the work, and at one point a deep depression in the bed called the "salmon-pool." At about the middle of the river is a great dip, fifty-five feet deep and fifty-five feet wide, called the "shoots." When the headings under the river were within 360 feet of meeting, a spring broke through into the land-boring on the Welsh side, flooding the whole work. At this time Mr. Hawkshaw was made chief engineer, with Mr. Richardson as "coadjutor." By the aid of pumps of greatly increased capacity, introduced by the contractor, Mr. Walker, of Bristol, the water was overcome. This could not be done, however, until a door in an interior bulkhead at 1,000 feet from the shaft had been closed; the operation being accomplished by a diver named Lambert in a Fleuss diving suit, which enabled him to remain below for an hour and a half.



ing-plant, in a picturesque location on the river's bank, consists of a pump-house, designed by J. H. Chapman, architect, of Boston, and two pumping-engines made by the Dean Steam-Pump Company of Holyoke, Mass., to-

* No. VI., the Water Tower at Asbury Park, N. J., was illustrated and described in our issue of September 2, page 321.

Shortly after resuming work (the level for the tunnel having been meantime lowered by Mr. Hawkley) there was an irruption of water from the salmon-pool. This was overcome and the junction of the headings made in September, 1881, the lines meeting within three inches. No further interruption occurred until October, 1883, when the

same spring which caused the original trouble again broke in with a flow of 27,000 gallons per minute.

The pumping power was sufficient, however, to overcome it, and in a fortnight operations were again resumed and continued safely to the completion of the tunnel a year ago when the first train passed safely through.

The timesince has been occupied in completing the permanent pumping and ventilating apparatus, enlarging the sections, etc. The tunnel is twenty-six feet wide and twenty feet high above the rail-surface. The depth of river bed over the crown ranges from 30 feet to 100 feet. The vitrified brick lining is three feet thick at the deepest point and $2\frac{1}{4}$ feet at the ends, about 75,000,000 bricks being used and 700,000 cubic yards of rock excavated. The highest rate of excavation was 400 yards per month. The gradients are 1 in 90 on the Welsh side and 1 in 100 on the English. The materials passed through are sandstone, coal, conglomerate shales, and marl, and "the excavation in some cases cost \$500 per yard."

The permanent pumping-apparatus will lift 20,000 gallons per minute, although probably only 5,000 gallons will have to be raised.

Like every other work of its kind this has had its special difficulties, and their magnitude has been such as to call forth the best skill of both engineer and contractor.

REPORT OF THE BOARD OF EXAMINERS ON THE DAMAGE TO BUILDINGS BY THE EARTHQUAKE IN CHARLESTON, S. C.

THE Board of Government Engineers and Inspectors appointed by the Mayor of Charleston to examine and report upon the condition of the buildings in that city after the earthquake completed their report last Friday. It will be seen that, in addition to a statement of the extent of damage, it also contains advice on the proper manner of rebuilding. We print almost the whole of the report, omitting only some details about the number of buildings examined. The report is signed by W. E. Spier, Inspector of Public Buildings for the United States Treasury Department, Captain W. H. Bixby, of the Corps of Engineers, U. S. A., Lieutenant F. V. Abbott, Corps of Engineers, U. S. A., and Joseph I. Waring, Secretary. The value of the report to Charleston is indicated by the *News and Courier*, which says that "their investigations and reports have been of immense benefit to the people, by giving them the necessary confidence and assurance to return to their homes, and in causing the necessary precautions to be taken for their personal safety. The committee may well be proud of the splendid services which they have rendered Charleston in the hour of her greatest misfortune, and have placed the people under a debt of gratitude which will always be remembered by them as one of the most pleasant features of this time of desolation and distress."

The report says:

"In our work of inspection in Charleston we have endeavored to faithfully and impartially decide what buildings were endangering the safety and lives of the people of the city, and to indicate briefly the most economical method of rendering these buildings safe for their customary uses. As with our limited time it was obviously impossible to examine carefully every building in the city, we have directed our inspection in such manner as to give what seemed to us the best general results.

"In all these inspections and examinations we have deemed it in general unnecessary to refer to buildings which were so greatly damaged as to be beyond repair, or to those whose injuries were limited to loosened plastering, loosened chimneys, and minor fractures.

"We estimate approximately that the buildings upon which we have rendered reports cannot be thoroughly repaired for less than \$2,000,000, and the remaining buildings, while of slight consequence as regards their danger to their owners, their occupants, and the public, will swell the moneyed value of real estate damages to a total of from \$5,000,000 to \$6,000,000.

"In this extended inspection and examination it is very probable that some deserving buildings have been omitted. If so, it was through accident or the force of circumstances. We feel sure, however, that the number will be found comparatively small.

"From the condition of the buildings already examined we can safely state that the unexamined residences with but few exceptions will be perfectly safe for occupancy as soon as their loose plastering shall have been removed and their chimneys repaired.

"We have been assisted in our work by Mr. J. P. Allen, United States Assistant Engineer, Mr. W. B. Guerard and Mr. J. H. Devereux, civil engineers, and Mr. L. J. Barbot, City Engineer. While we are much indebted to all of these gentlemen for their assistance, we wish to extend special thanks to Messrs. Allen and Guerard, who by their arduous work in the preliminary examination of over nine hundred buildings enabled us to devote the greater part of our own time to those buildings most needing our attention. We wish also to express here our special appreciation of the care, accuracy, and untiring energy of our secretary, Mr. J. I. Waring.

"In response to many requests from various citizens, we venture here a few remarks upon the methods of construction and quality of materials of many of the buildings of the city. In so doing, we wish it distinctly understood that our remarks do not apply to the methods or materials of individual architects or builders, but to building construction in general, as illustrated by the experience of our recent inspections.

"We have found that buildings constructed with good materials and good workmanship have, in general, suffered the least damage; that the worst ruined buildings in general show their original weakness, either in poor sand, poor plastering, poor mortar, thick bed-joints, use of unmoistened brick, insecure body, unanchored walls, unanchored gables, unanchored chimneys, unbuttressed arches, unanchored parapets, excessively heavy parapets and cornices, heavy unanchored projections from side walls, unanchored porticos and piazzas, improperly trussed roofs, or improperly supported roofs. In many cases we see the same poor materials and workmanship still being used in the repairs or reconstruction of the already damaged buildings.

"Universal experience has shown the necessity of certain features of building construction, many of which we give briefly, as follows:

"Sand, suitable for mortar, should be clean, crystalline, with sharp angles and edges, and entirely free from clay or loam.

"The so-called yellow sand of Charleston contains so much clay or loam and so little real sand that it is almost worthless for use in mortar.

"The so-called gravel of Charleston is what is called coarse building sand in other parts of the world, and if the larger particles of this so-called gravel be removed by passing the 'gravel' through screens or sand-sieves, the remaining portion would constitute an excellent and true building sand.

"Lime should be slaked and allowed to cool at least twenty-four hours before use in mortar and ten days before use in plastering. Otherwise the lime will continue to slake and expand after it is put into the walls, joints, or plastering.

"Cement mortar should be mixed in very small quantities, and should be used immediately after it is mixed.

"Mortar, when properly made, soon becomes as hard as brick or stone. Mortar joints may be as thin as a quarter of an inch, but should never be more than three-eighths of an inch in thickness. In some cases we have found joints from 1 to $1\frac{1}{2}$ inches thick.

"The first coat of plastering on lath-work should be rich in lime and hair, and the total thickness of the finished plastering should not exceed a half of an inch. In some cases we have found plastering made of so-called yellow sand, without hair, on lath-work where the plastering was entirely detached from the lath-work, although still held in place by the wall-paper of the room. In other places we have found plastering from one to two inches thick.

"Dry brick should always be thoroughly wetted before being laid upon mortar. Otherwise the dry brick will absorb all the water from the mortar before the mortar has time to set, thus leaving the mortar in the shape of a dry, sandy, granular mass, of no adhesive power. This custom of wetting the brick before use is universal throughout the world.

"All masonry walls should be thoroughly banded through their entire thickness, with whole bricks at least every five courses.

"All masonry walls should be securely anchored to the floor, ceiling, and roof timbers with iron anchors built into the walls and firmly secured to the timbers.

"On each tier of beams there should be at least one anchor to each and every pier between openings (doors and windows), and at least one anchor to every eight feet of length of walls built without openings. In a similar

way the tops of all masonry gables should be firmly anchored to the roof timbers.

"All chimneys rising more than five or six feet from the roof should be secured by stay-rods.

"The use of heavy parapets and heavy cornices should be discontinued. All such projecting pieces, if used at all, should be made of thin iron or other lighter material.

"All porticos and piazzas, whether of masonry or wood, should be firmly anchored to the timbers or to the opposite walls of the buildings of which they form a part.

THE FLOW OF WATER UNDERGROUND.

We are indebted to Mr. George G. Anderson, Engineer of the Platte Land Company, of Colorado, for a very interesting table, which we publish below, giving the results of measurements at successive points on the Cache la Poudre River made by Mr. E. S. Nettleton, State Engineer of Colorado:

Measurements of Seepage Water in the Cache la Poudre River:

Places where measurements were taken.	1. Amount of water in river. Cubic ft. per sec.	2.* Amount of water diverted from river by canals. Cubic ft. per sec.	3. Amount of water in the river at the points measured plus that diverted by canals between these points. Cubic ft. per sec.	4. Amount of increase in the volume of the river between the points measured. Cubic ft. per sec.	5. Amount of increase in the river from the cañon to the point where measured. Cubic ft. per sec.
First River measurement Pleasant Valley and Lake Canal	127.609	...	.....	.....	.....
Larimer County Canal ..	...	1.75	.....	.....	.....
Jackson Ditch .....	...	0.58	.....	.....	.....
Cache la Poudre Ditch ..	...	0.266	.....	.....	.....
Larimer No. 2 Canal .....	...	1.00	.....	.....	.....
New Mercer Canal .....	...	0.534	.....	.....	.....
Fort Collins Canal .....	...	0.228	.....	.....	.....
		1.14	.....	.....	.....
		5.498	.....	.....	.....
Second River measurement ..	133.973	...	139.471	11.862	11.862
Larimer and Weld Canal ..	...	1.731	.....	.....	.....
Judge Howe's Ditch .....	...	2.60	.....	.....	.....
Josh Ames's Ditch .....	...	0.69	.....	.....	.....
The Lake Canal .....	...	1.748	.....	.....	.....
Cache la Poudre Canal No. 2 .....	...	3.216	.....	.....	.....
		9.485	.....	.....	.....
Third River measurement ..	149.985	...	159.470	25.497	37.359
The Whitney Ditch .....	...	1.583	.....	.....	.....
Cache la Poudre Canal No. 3 .....	...	5.870	.....	.....	.....
		7.453	.....	.....	.....
Fourth River measurement ..	161.863	...	169.316	19.331	56.690
Ogilvy Ditch .....	...	38.955	.....	.....	.....
Fifth River measurement ..	153.117	...	192.072	30.209	86.899

*[The quantities given in this column are so small that we judge the head-gates had been shut down so as to allow only a supply for strictly domestic uses, to pass during the continuance of the dry weather; but our correspondent gives no explanation.—ED. SAN. ENG.]

The first measurement was made in the flume in the cañon above all irrigation canals; the second about $2\frac{1}{2}$ miles above Fort Collins, about 9 miles below the first; the third at the dam at the head of the Cache la Poudre Canal No. 2, about ten miles below the second; the fourth at one-fourth of a mile below the head of Cache la Poudre Canal No. 3, about eleven miles below the third; the fifth at one-third of a mile below the head of the Ogilvy ditch, about ten miles below the fourth, and forty miles from where the first was taken.

At various points on the line of the river canals intercept a portion of the flow, and it is evident that if there was no inflow from the earth and no loss by evaporation or filtration, the sum of the flows in the several canals added to that in the river at a point below the lowest canal could never be more than the amount flowing above the upper canal. On the contrary, there is found to be a progressive filtration or "seepage" into the stream, giving a constant increase, as shown by column 3, which gives the amount that would have been in the stream according to the successive measurements had there been no diversions from it.

Column 4 shows the increase between successive points of measurement obtained by subtracting the actual flow at the next preceding point, as given in column 1.

Column 5 gives the total increase, and is obtained by taking the sum of all the partial accessions, as shown in column 4. The interesting result is reached, that without any tributaries the inflow from the earth in a distance of forty miles, making no allowance for evaporation or other loss, was sixty-eight per cent. of the quantity at the head of the section experimented upon.

These measurements were made in the latter part of October of last year, when the water was as low in the stream as it usually gets.

A certain portion of the increase noted may be nominal, and due to a return in part of that taken out by the lateral canals, but the remainder *must* be from an underground flow from higher sources. The only other explanation is, that the water was gradually draining from ground previously irrigated, when a full supply was flowing in the ditches.

Another correspondent writes us respecting the recent dry weather at Denver as follows:

"They had a very dry time, and the question of irrigation was an interesting one to look into just then. It was found that the 'English' Company was taking about 85 per cent. of the flow of the Platte, which was 312 cubic feet per second, while there were over 1,000 cubic feet required by prior rights before the company were legally entitled to a drop."

COTTAGE (SMALL) HOSPITAL CONSTRUCTION.

BY HENRY C. BURDETT.

Author of Cottage Hospitals, Pay Hospitals of the World, etc.

No. IX.*

SANATORIUM AT THE REEDHAM ASYLUM FOR FATHERLESS CHILDREN.

THIS building has been erected for the purpose of isolating children, inmates of the asylum, who may be attacked by contagious or infectious disease, and it has been designed with the special object in view of treating at one and the same time three distinct classes of disease. To carry out this object, the governors called to their aid as architect the Professor of Architecture at University College, London, and to advise with their own medical officer and the architect on medical points no less an authority than Dr. Carpenter, of Croydon, a member of the late Royal Commission on Hospitals for Infectious Diseases. From the collaboration of such distinguished professional advisers we might fairly expect a result closely approaching perfection, or at any rate a building from which something could be learnt. Whether this is so or not we will leave our readers to judge.

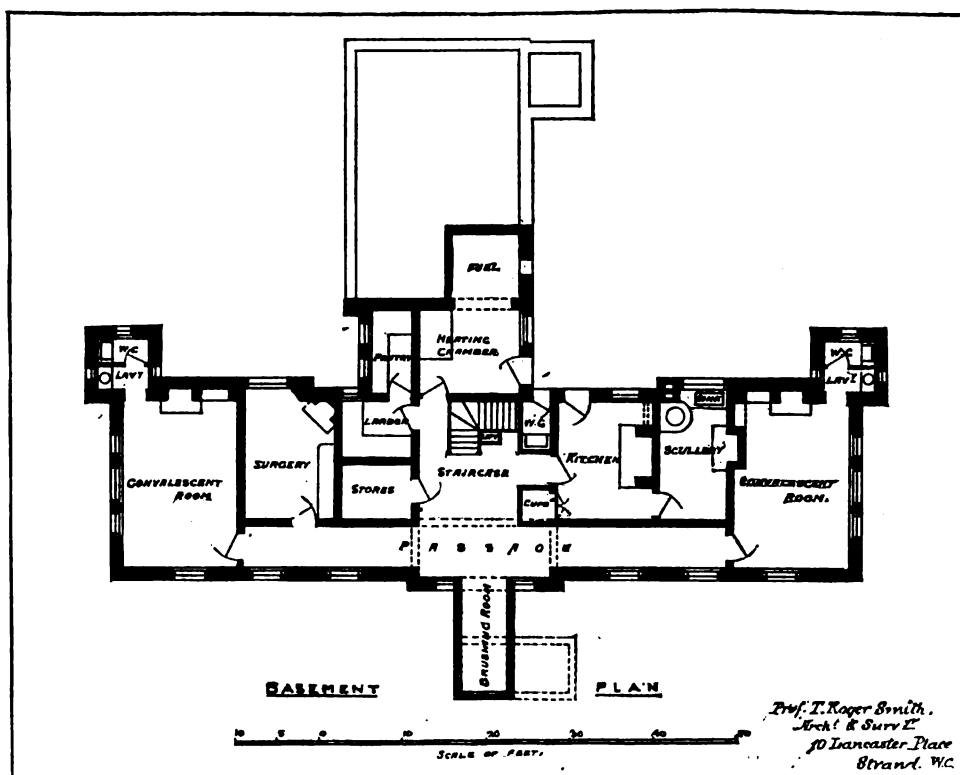
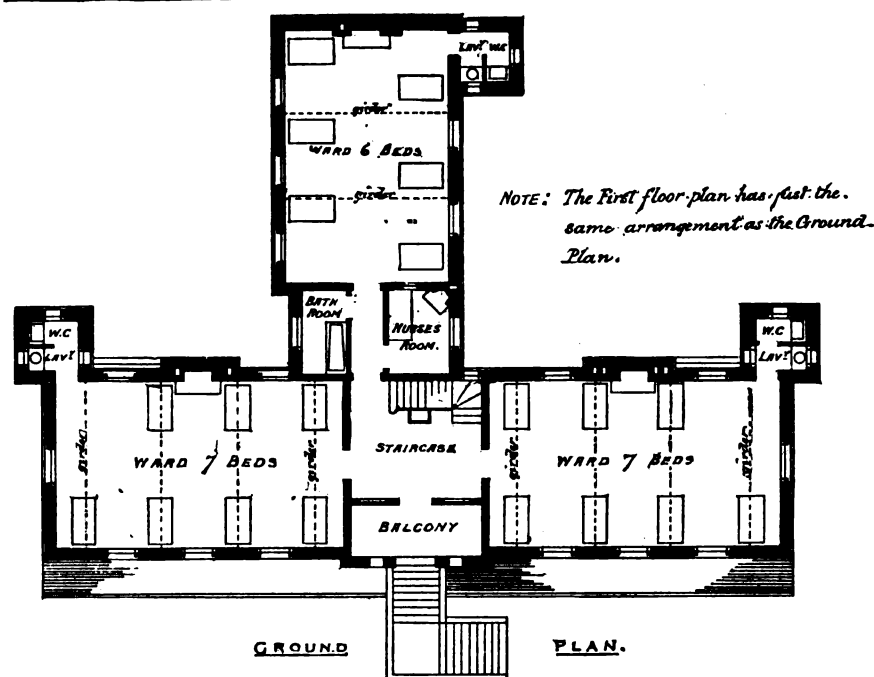
The building consists of three floors, and stands well raised up from the surrounding ground. The two upper floors are the ward floors, the ground floor being devoted to administrative purposes.

The plan of the building takes the form of a T, in which the central part is occupied by the staircase, a small portion of the up-stroke by a nurses' room and bath-room, and the rest of the letter by the wards. On each of the two floors, therefore, there are three wards approached by a common staircase and provided with a common nurses' room and bath-room.

A narrow passage, unventilated except through the staircase, leads from the landing to the ward at the back. Thus every means that could be devised have been taken to provide the fullest atmospheric communication between each ward and the other two. Nurses and servants from one ward would also be constantly coming into contact with nurses and servants from the other wards, and, to add to the facilities for the spread of infection, a lift placed in the centre of the staircase provides for the constant interchange of air from one floor to another. Assuming that the patients on one floor would be all of one sex, it would be interesting to know how it is proposed to make one bath-room serve for three such diseases as (for instance) scarlatina, measles, and typhoid. The wards themselves are well proportioned and of fair area, but the two front wards are spoiled by the position of the fire-places, which ought to have been in the end walls, where the windows are placed; the cross-ventilation would then not have been impeded by the omission of a window, and the fire-place itself would have been of far greater service for patients able to sit up. Each ward is provided with a water-closet and lavatory. The lavatory is placed in the lobby to the water-closet, the result of which arrangement is that the lobby is far too wide to be

* No. VIII., the Norwood Cottage Hospital, was illustrated in our issue of September 2, 1886.

SANATORIUM AT REEDHAM



of much service in disconnecting the water-closet from the ward. There is no provision whatever for emptying bed-pans or for cleaning them, or for keeping the brooms and other things used in cleaning the wards.

The ground floor contains, in addition to the usual kitchen offices and a surgery, two convalescent rooms. We must assume that when this building is occupied by three distinct kinds of disease, patients of only one class can be allowed to be convalescent at the same time, or else that the use of the convalescent-rooms will be restricted to one class only.

The conclusion to which we are compelled to arrive, after a careful examination of the plan, is that the building fails signally to fulfill the purpose for which it was designed. It is obviously impossible to treat at the same time three different classes of infectious diseases of such a nature as would be likely to occur in a large orphanage. And the failure—for failure it assuredly is—is the less excusable, in that it is the work of men so prominently before the public as Dr. Carpenter, of Croydon, and Professor Roger Smith.

BRICK-MAKERS' NATIONAL ASSOCIATION.

(From our Regular Correspondent.)

CINCINNATI, September 25, 1886.

THE Brick-Makers' National Association, a new organization, held its first convention here Wednesday and Friday of this week. Those present or represented were:

D. V. Purrington, Chicago; J. M. Billingsley, Indianapolis; R. B. Morrison, Oakdale, Geo.; J. C. Adams, Indianapolis; B. W. Blair, Cincinnati; J. W. Penfield & Son, Willoughby, O.; E. A. McGintie, Chicago; G. N. Sherer, Terre Haute; G. F. Ballou, Canandaigua, N. Y.; J. A. Blaffner, New Orleans, La.; Cyrus Chambers, Philadelphia; A. J. Freckler, Chicago; Lindley Vinton, Indianapolis; W. S. Kolin, Richmond, W. Va.; F. C. Frey, Bucyrus, O.; J. M. Burkhart, Marion, O.; John M. Blair & Sons, Cincinnati; A. O. Jones & Co., Columbus, O.; Standard Brick Company, Aurora, Ind.; C. J. Holman & Co., Sargent Bluff, Iowa; Fletcher & Thomas, Indianapolis; John Walker, Aurora, Ind.; Henry Martin, Lancaster, Pa.; Sutton Brick and Tile Company, Urbana, Ill.; Chattahoochee Brick Company, of Georgia; G. W. Campbell, Paris, Tenn.; Walligs & Hollis, Canandaigua, N. Y.; B. L. Holt, Montgomery, Ala.; L. A. Charles, Lexington, Ky.; Isaac DeForest & Son, Sharon, Pa.; W. R. Cunningham, Frankfort, Ind.; J. G. Wagner, Covington, O.; R. B. Wilson, Cincinnati; Martin Itter, Omaha, Neb.; John Itter, York, Neb.; Ittner Bros., St. Louis; H. Livesey, Omaha, Neb.; E. B. Hall, Toledo, O.; J. P. Guinness, Hancock, Mich.; J. R. Laws, Lexington, Ky.; George E. Noyes, Washington, D. C.; P. B. Watkinson & Son, St. Louis; W. D. Gates, Terra Cotta, Ill.; W. L. Grant, Goldboro, N. C.; T. A. Randall & Co., Indianapolis; J. J. W. Billingsley, Indianapolis; Adrian Brick and Tile Company, Adrian, Mich.; John R. Man-

tle, Vincennes, Ind.; Joseph Budd, Rockland, O.; O'Gorman Bros., Ottawa, Ill.; J. R. Kemp, Youngstown, O.; L. P. Dodge, Montgomery, Ala.; Nolan, Maddern & Co., Rushville, Ind.; Prof. R. T. Brown, Indianapolis; J. A. Close, Woodstock, Ont.; J. D. Conger, New Albany, Ind.; Frank M. Wheeler, Richmond, Ind.; J. H. Barker, Cincinnati; J. D. Caldwell, Menominee, Wis.; E. A. Hershberg, Milwaukee; McK. M. A. Sprague, Gallipolis, O.; Charles W. Raymond, Dayton; Root & Frey, Wilkesbarre, Pa.

The following papers were read by their authors, the subjects indicating the questions of interest to the brick-makers and users: "Our Association," by D. V. Purrington, Chicago; "Economy in Mining Clay," by B. W. Blair, New Richmond; "Tempering Clay," A. I. Charles, Lexington, Ky.; "Brick-making in the South," R. B. Morrison, Oakdale, Geo.; "Dry Pressed Brick," F. B. Meyenberg, Chicago, Ill.; "Past History and Future of Brick-making," R. T. Brown, Indianapolis; "Heat Furnaces," W. A. Eudaly, Cincinnati; "Preparation of Clay," Anthony Ittner, St. Louis; "Artificial Drying," J. K. Caldwell, Menominee, Wis.; "Brick for Street Paving," by J. J. Billingsley, Indianapolis; "Soft Brick as a Building Material," J. J. Busse, Covington, Ky.; "Clay Working in the Pacific States," Charles Gladding, San Francisco, Cal.; "Enameling Brick," O. D. Wheeler, Philadelphia; "Artificial Drying," R. B. Wilson, Cincinnati; "Dry Clay Process," Anthony Ittner, St. Louis; "Hudson River Brick Interests," Edward Brockway, Haverstraw, N. Y.

The following officers were chosen: President, W. W. Eudaly, Cincinnati; Vice-President, J. A. Blaphy, New Orleans, La.; Recording Secretary, W. D. Gates, Terra Cotta, Ill.; Corresponding Secretary, T. A. Randall, Indianapolis; Treasurer, A. J. Wenker, Chicago.

PLANNING HOUSES FOR HOT CLIMATES.

NEW YORK, September 20, 1886.

SIR: In common with all the readers of your paper, I have been greatly pleased with the beauty and convenience of the designs for dwellings with which it is illustrated, but have been struck with the area of roof that many of them present to the sun.

Our forefathers, with the practicable sense that characterized our people before the general advent of high education, promptly recognized the heating power of our sun, and built their houses with a short and steep roof, facing the south, the pitch toward the north being extended in a "lean-to" of flatter slope, thus presenting the smallest practicable surface to the normal rays of the midday sun. While great improvements have been made in our appliances for heating, nothing has been done in the way of cooling residences, and until that problem is worked out attention to the lost wisdom of our progenitors would tend to make our country houses more comfortable, at the same time re-establishing a distinctively American style of building.

Please allow me to take this opportunity to protest against a couple of half-timbered gables that project themselves on my eyes when walking down Fifth Avenue. The complaint is that the carved timbers are very regular "ogees." An inspection of any old half-timbered house will readily show that the carved pieces are flattened branches of oak or elm trees, and nature never makes the mistake of putting regular curves into her building, but follows the law as laid down by Lord Kames, that a beautiful curve constantly changes its rate of curvature, or words to that effect. There is no economy in using branches of trees in this country, sawn timber being cheaper, and transmitting strains with a smaller expenditure of material where employed as a strut; but if branches are supposed to be used, should they not conform to the irregular curves of nature? CIVIL ENGINEER.

TORONTO COMMISSIONER OF WORKS AND HEALTH.

(From an Occasional Correspondent.)

THE applications for this appointment were opened on the 20th. The applicants are: H. M. Ruttan, Winnipeg; W. Bell Dawson, Montreal; William Boulton, Toronto; P. St. George, Montreal; G. L. Fitzgibbon, Hull, Eng.; J. E. Elsom, New Albany, Ind.; Silas Seymour, New York; L. W. Burt, Hartford, Conn.; J. S. Goshorn, Fort Wayne; O. N. Gardner, Akron, O.; Edward D. Bolton, Boston; Edward McConnell, Cresap, W. Va.; Chester B. Davis, Chicago; George R. Radford, New York. Five applicants declined to allow their names to be published. The Mayor asked Captain Eads to recommend an engineer, which he did. Information regarding the appointment was sent to the nominee.



AN ALLEGED CAUSE OF SECRETARY OF THE TREASURY MANNING'S ILLNESS.

ASSOCIATED PRESS dispatches state:

"Washington, September 22.—Workmen were engaged to-day in tearing the plumbing out of Secretary Manning's private office. They found a pipe four inches in diameter, besides several smaller pipes, leading directly to the sewer, without any trap or contrivance to prevent sewer-gas from coming into the room. These pipes strike the sewer just at its head, where the greatest amount of gas is formed. In the winter, when the doors and windows were shut, the air was most oppressive, and sometimes in the coldest weather Mr. Manning was forced to open the window. He was urged not to sit in there, but it was the only place in which he could find absolute privacy. His physicians pronounce his disease blood poison from sewer-gas, and say that it was brought on, beyond doubt, by his sitting in that room."

Criminally stupid plumbing and drainage work, together with neglect of proper care in maintenance of the drainage and plumbing work in the building, fairly describes a condition of things hitherto existing in the Treasury Building, at Washington. To what extent this is a fair sample of its condition in other parts of the building we do not yet know, but the examination now going on will doubtless reveal more of the same sort. Through the courtesy of Mr. Samuel A. Robinson, Inspector of Plumbing of the District of Columbia, we are enabled to furnish the following sketches and description of what was found:

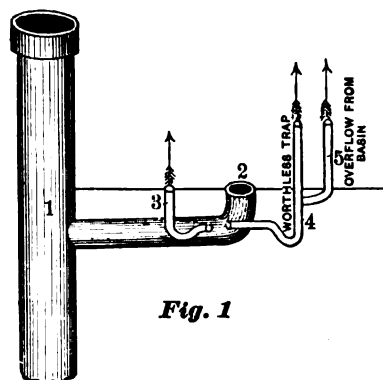


Fig. 1

Set on the 4-inch bend was originally a pan water-closet, but at the time the work was torn out a wash-out closet without trap ventilation. At every pull of closet the trap of wash-stand as well as the closet-trap was syphoned.

The pipe 3 was slightly bent trap-shape and was intended to hold water, but, of course, has been perfectly dry for years, and was found dry when taken out, and its mouth wide open, delivering the sewer-air into the room continuously.

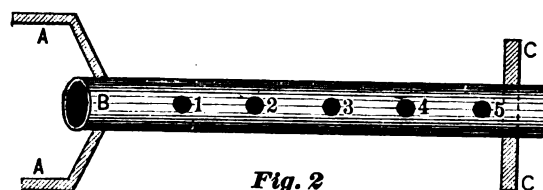


Fig. 2

C C, section of cellar-wall.

A A, head of 3-foot brick sewer.

B, section of abandoned 4-inch steam-pipe, supposed to have been used at some remote time as a drip for steam-coils. 1, 2, 3, 4, 5, one-inch holes left open. This part of the pipe was left uncovered except by trash, which allowed the gas to escape constantly.

The foregoing seems to require little further explanation. The original drainage system of this building was doubtless planned and executed many years ago, when blunders in plan were the rule and not the exception. The original mistakes have been supplemented by subsequent work done at different periods by probably different parties, each one of whom was employed to do certain work without regard to its effect on or relation to what existed or had been done before. Just when the plumbing-work shown in

sketch Fig. 1 was done or by whom we do not know, but if it were done by any plumber in New York since 1882 the guilty party would be liable to fine and imprisonment. The defects in the drainage system the plumber is probably not responsible for.

PLUMBING IN THE TWELFTH REGIMENT ARMORY, NEW YORK CITY.

WE illustrate this week the principal features of the plumbing in the Twelfth Regiment Armory. The building is of brick, with granite foundations and trimmings, and covers the block on Ninth Avenue between Sixty-first and Sixty-second Streets, with an administration building on

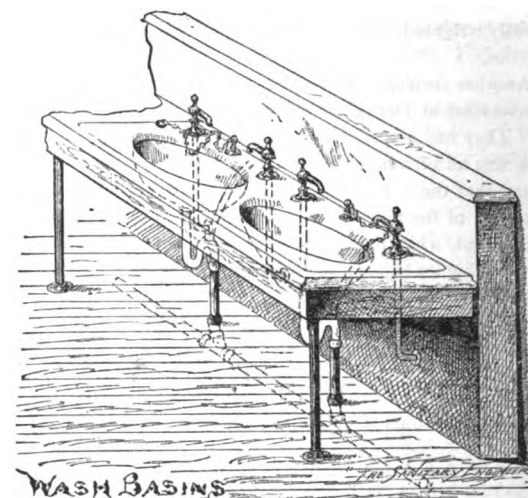


Fig. 3.

Sixty-second Street 150x100 feet. The drill-room on Ninth Avenue is 200x175 feet. The drainage is divided into three systems, each connected with the public sewer by 8-inch cast-iron pipe. That on Sixty-first Street takes the rain-water from the western half of the drill-room roof; the Ninth Avenue system takes the storm-water from the west roof of the drill-room, and the Sixty-second Street system, with which we are most interested, takes both storm-water and sewage from the administration building.

The arrangement of the plumbing is direct and the pipes exposed. As one passes in at the main entrance, the first door to the right leads to the Colonel's room, off of which is a toilet-room containing a water-closet, basin, and urinal. The small space available has been skillfully used, and the trimmings of the fixtures being Italian marble makes light what would otherwise be a dark room. Details of this room will be given in a later issue.

Passing through the main hall to the rear of the building and descending the broad stairs to the basement floor, we find a row of eleven oval basins, Fig. 1, set along the wall to the left, well lighted from windows in the rear and within easy reach of the men. Here, as elsewhere, needless complication has been avoided with a most workmanlike result. One point in this connection may,

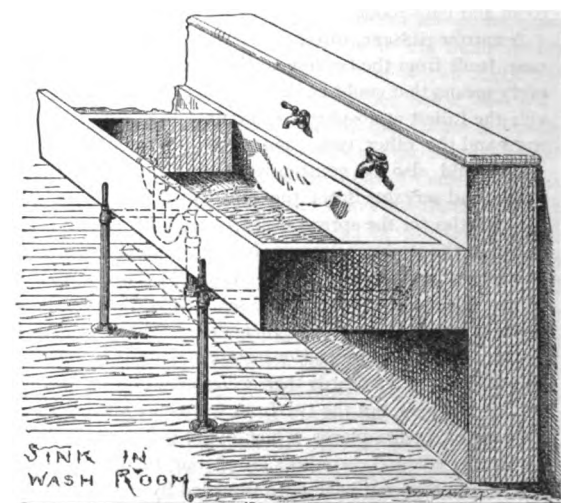


Fig. 5.

however, interest some of our readers, and that is the use here (as elsewhere in the building under similar circumstances) of long brass tubes in place of ferrules between the traps and the hubs of the cast-iron pipe (Fig. 1). The advantage claimed is, that being stiff metal, the brass

will not flatten and close up under hard usage, as is so often the case with lead pipe.

Beneath the basement stairs is a shower-room, fitted up with two showers arranged as shown in Fig. 2. The pipes and fittings are of polished brass, and the whole apparatus very tasteful in design. To prevent the person using the bath from being scalded by turning on the hot water before the cold, the hot-water pipe is connected with

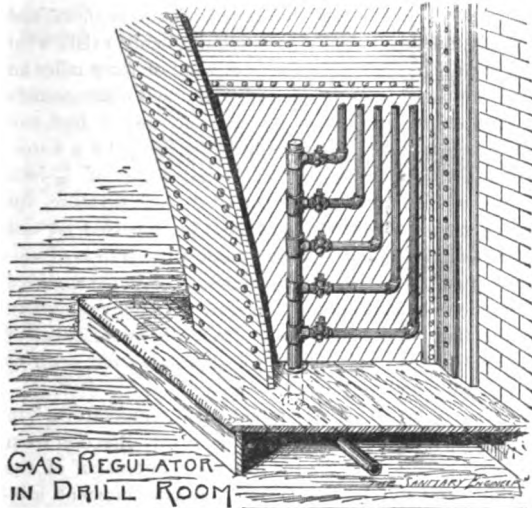


FIG. 7.

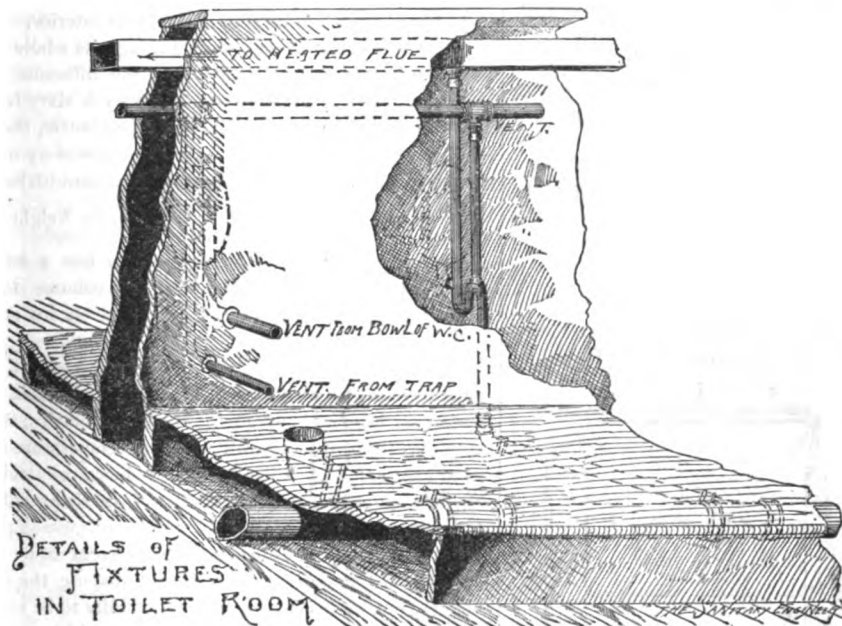
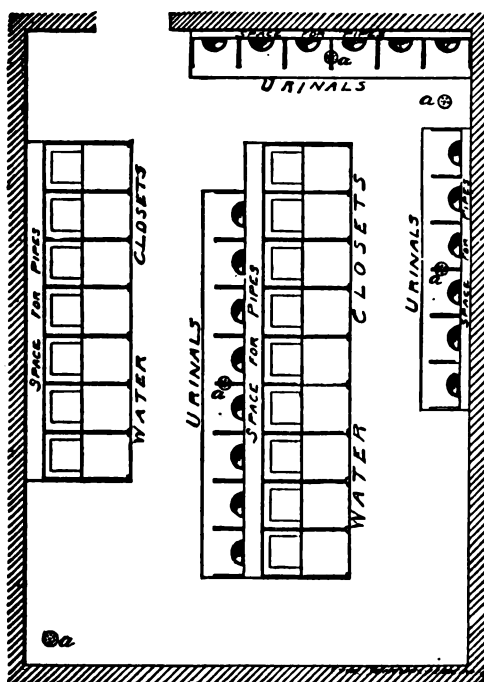
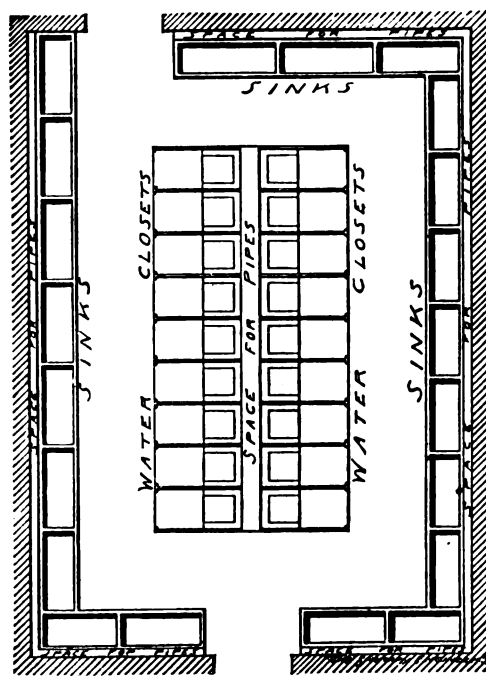


FIGURE 6.



PLAN OF TOILET ROOM.

FIG. 4.



PLAN OF WASH ROOM.

FIG. 3.

the cold supply below the valve controlling the latter, with check-valves as shown, so that it is impossible to draw hot water without first drawing cold. To the right of the staircase and opening out from the main hall are a wash-room (Fig. 3) and toilet-room (Fig. 4). The sinks in the wash-

room are of soapstone, supplied with hot and cold water, and supported on galvanized-iron stands made of piping (Fig. 5) fastened to floor and wall. As there is no wood-work about them they can be readily kept clean and can therefore never become offensive. The general arrangement of the urinals and water-closets in the toilet-room is shown at Fig. 6. Each fixture is provided with local ventilation by pipes connecting with a galvanized sheet-iron duct, which in turn opens into the base of a brick flue, terminating at the roof, at the base of which a Bunsen burner is kept constantly burning. By using the *inlet* side of the trap for the local vent-pipe, and by connecting the waste *above the seal*, very good results are said to have been obtained. The floors are in every case asphalt and the settings and safes of slate.

The other fixtures in the building are a small toilet-room on the ground floor for the use of guests, a wash-room off the gymnasium on the third floor, which will be described in a later issue, and a kitchen in the basement.

A copper-lined tank holding 1,500 gallons, hung on the ceiling of the third floor, and supplied by a Worthington pump, furnishes water for the fixtures on the upper floors. Hot water is taken from a wrought-iron steam-coil heater holding 150 gallons and so arranged as to be cut off when the boilers are not running and allow the whole building to be supplied from the kitchen-boiler across the hall.

Another point of interest is the arrangement for regulating the gas in the drill-room. The main is brought up

ment the armorer can regulate the gas for the entire drill room from one point.

The architect was Mr. James E. Ware, the master plumber Mr. John Renehan, both of this city.

PLUMBERS' STRIKES IN THE WEST.

[From the Kansas City Times.]

THE Goss Steam-Heating and Plumbing Company had all its new employees sworn in as special police yesterday, for the purpose, it was said, of protecting themselves against any attempt which the striking plumbers might make to interfere with their work. Each man had a star on the lapel of his coat and a revolver strapped about his waist, and the forty plumbers and gas-fitters employed by the firm presented a martial appearance, which was in marked contrast with their avocation. All the places left vacant in that house by the strike of the journeymen plumbers have been filled, but the condition of affairs is different everywhere else in the city, the boss plumbers saying that the situation is very bad and that it is difficult to tell what the outcome will be. The bosses say that they find it impossible to secure competent men to fill the places of the strikers, and that the outlook for amicably settling the strike is far from being bright.

The Kansas City Journeymen Plumbers' Association is governed by the Executive Board of the National Union of Journeymen Plumbers. The national organization is an immense one, and it has a large treasury account on which any union, which strikes with the advice of the Executive Board, can draw freely. The Kansas City union yesterday received a letter from the plumbers' union of Milwaukee, with a check inclosed for \$700 and simply the word of

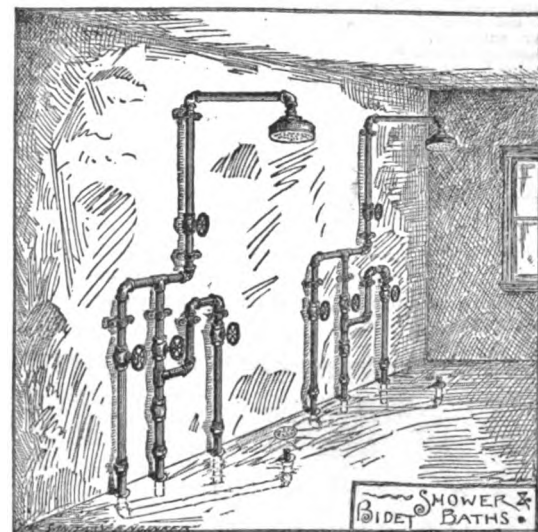


FIGURE 2.

advice, "Stick!" The strike of the Kansas City union is one of a number of strikes all over the country, beginning with a contest between the Master Plumbers' Association and the Journeymen's Union of New York, in regard to the apprenticeship question. This was only a few days ago, but the movement spread rapidly through the East, and the Executive Board advised the union assemblies in various cities to make some move toward bettering the class of workmanship in the plumbing business. That was the alleged motive of the national association, and letters of inquiry were sent to the different unions throughout the country inquiring how much wages the men were being paid, who the employers were, how many men each controlled, and the nature of the plumbing-work done. The Kansas City union replied to the letter it received—that they had struck two months ago for a day of eight hours, but had been unable to obtain it. They said they then modified their request by asking that the day be limited to nine hours during every day except Saturday, when eight hours would constitute the working day. These terms were accepted by the master plumbers, and the men returned to work again. They also wrote that they were on the eve of another strike for 45 cents advance on the day's wages. They stated that they had \$1,000 in the treasury and thought they could enforce their demands. The national union advised them to do so, and Monday all the journeymen plumbers in Kansas City walked out and quit employment.

At the same time that the plumbers here struck the plumbers at Leavenworth and Atchison also walked out for much the same cause as that for which they struck here.

These are the demands of the Kansas City union, as stated in their expression of grievances: "We ask for 45 cents advance on each day's wages; 10 hours' pay for 9 hours' work each day except Saturday, then 8 hours' work, with 9 hours' pay. We ask that when a man is about to be discharged a written statement of reasons for so doing be submitted to us."

PHILADELPHIA TRADE-SCHOOLS. (From our Regular Correspondent.)

PHILADELPHIA, September 24, 1886.

THE season for the opening of schools is now at hand, and the officials of the manual training schools of the city are at work registering the pupils and completing arrangements for the coming season. Much interest is now being taken in this city on the subject of hand education, as well as the brain, and the schools of the Spring Garden Institute, Franklin Institute classes, and the numerous offspring of these older organizations, all have a very promising outlook. Nothing has yet been done by the Master Plumbers' Association looking to the opening of their school for the plumbing apprentices for the winter, owing to the season, but it seems probable that the school will shortly open, and no doubt it will give a very hand-some account of itself in the benefit given to the boys. The members of the association almost to a man are much impressed with the importance of the school, and, having seen the benefits derived therefrom, are determined to make it more efficient in the future than in the past.

The work of tearing down the old Market Street Bridge across the Schuylkill River, which is to be replaced by the new iron bridge, is already contracted for. The bridge now being demolished was erected in 1875 to replace temporarily one that had been destroyed by fire. The new bridge has been contracted for at the price of \$271,000.

Novelties.

Under this heading we propose to describe and illustrate appliances of probable interest to our several classes of readers. The selection will be made without reference to the wishes of agents or patentees, being governed solely by considerations of novelty, ingenuity, and probable interest to readers, and especially the fact that they have not been elsewhere described. As a rule we shall make no comments, and it is to be distinctly understood that a notice does not imply approval. No charge will be made for these notices, and any offer of pay for their insertion will insure their omission. We shall be glad to have our attention called to novelties suitable for this section.

RADIATOR AND WARMING-CLOSET FOR DINING-ROOMS.

THE accompanying illustrations, Figs. 1 and 2, show an improved warming-closet for dining-rooms in combination with a Bundy radiator about to be put on the market.

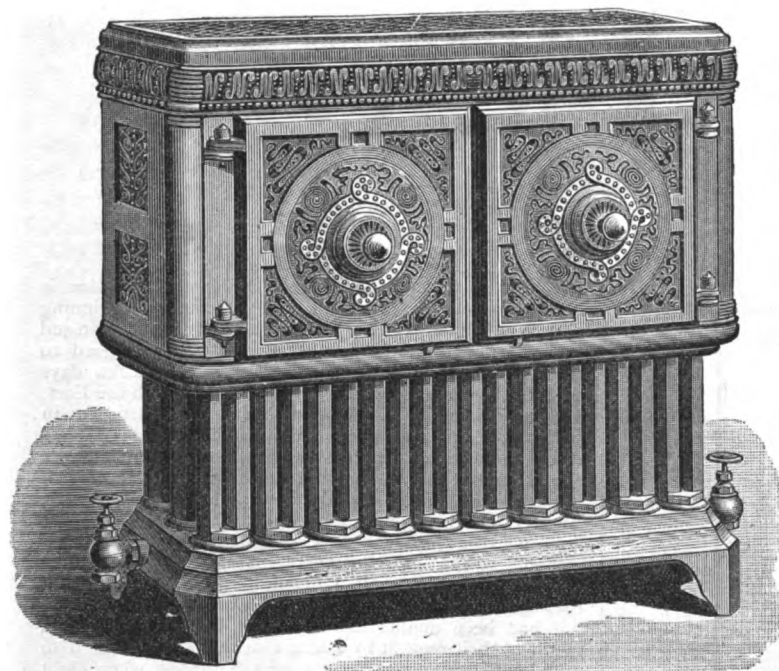


FIGURE 1.

Fig. 1 is a perspective view showing the general appearance of the arrangement as it will stand in a room; the upper part being made of bronze metal when desired, or a less expensive closet will be made of cast-iron finished in bronze. The radiator-tubes are made shorter than the ordinary, so the extreme height will not be excessive, but in other respects it is an ordinary cast-iron loop radiator. A better conception of the closet can be obtained from Fig. 2, which is a cross-section on a vertical line through the centre. The bottom of the oven proper is open-work, as is also the shelf through which the warm air percolates, surrounding the dishes; and the top, although it is ornamental fret-work, has a thin metal screen which hinders the too free escape of the warm air in that direction. Should anything be placed on the outside of the top to be kept warm, the openings at the back are arranged to take off the air.

The illustrations are suggestive of the further uses of the arrangement.

It is patented and manufactured by the A. A. Griffing Iron Co., of Jersey City, N. J.

Correspondence.

EFFECT OF WIND AND BAROMETRIC PRESSURE ON TRAPS.

ROCHESTER, N. Y., September 4, 1886.

SIR: In the last number of THE SANITARY ENGINEER reference is made to reports of two cases where the seals of traps have been affected by high winds. My own experience leads me to believe that such cases are of very frequent occurrence, and a series of careful experiments which I made some years ago demonstrated the fact that the water-seals of traps are violently disturbed, and even lost altogether, during windy or cold weather, when the soil-pipes with which they are connected are ventilated in the usual way.

I am sure general careful and systematic observation would establish the fact that this disturbance and loss of trap-seals happens very often in houses where it is little suspected. We seldom hear anything about it, because of the difficulty of observing the phenomenon.

Extremely low temperature and changes in the density of the atmosphere seem to cause the trouble as frequently as high winds, and I find a fresh-air inlet the full size of the soil-pipe does not lessen the difficulty.

Water-closet traps are apparently most easily affected. I find some forms of hopper-closets incapable of keeping their water-seals intact longer than two hours at a time, under certain atmospheric conditions.

Of course there is great danger from this state of things, and our only safety is to recognize the cardinal principle that all trap-seals should be strong and deep, that every water-closet should have the seal in full sight and of a depth of several inches.

Respectfully yours,
WILLIAM E. HOYT.

[We are of opinion that our correspondent has somewhat overstated the risks of having traps forced by wind-

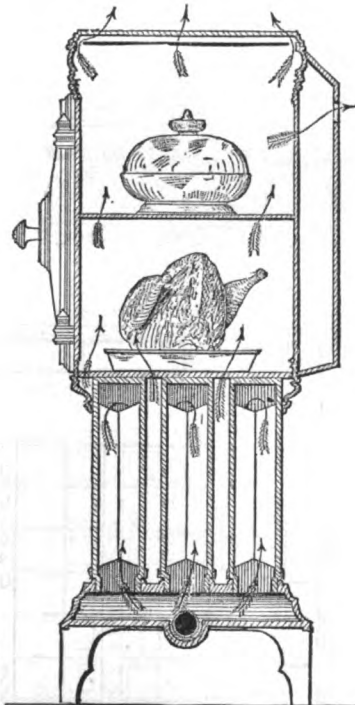


FIGURE 2.

pressure or changes of weather, when the drains are open to the air at both ends, although we agree with his conclusion in the last paragraph as to having water-closet traps exposed to view so far as possible. But if their depth of seal is "several inches," as there recommended—i. e., more than two inches—we encounter another evil—viz., difficulty in forcing quite through the trap the whole of each defecation without an unreasonable waste of flushing-water.

We fail to see how changes in pressure, as recorded by the barometer, arising from meteorological phenomena in the open air, can affect our trap-water in any appreciable degree, for no house, even in St. Petersburg in January, is calked so tight as to show any visible difference in the barometers exposed inside and outside of such a house at any one time, no matter how rapid the change may be.

Neither do we see how winds can affect the seal of traps of water-closets appreciably when the drains are open to the atmosphere at top and bottom of the house. If a gale of wind—say with a velocity of forty miles per hour—were to blow into the outfall of an unventilated sewer, a pressure would perhaps result that would tend to force the seal of the main traps of house-drains, or, in the absence of such traps, would tend to force the seals of water-closet traps, provided the upper ends of soil-pipe stacks were closed, and then only. Even if such unvented dead-ends exist, what could such pressure amount to? A wind of forty miles an hour is supposed to exert a pressure of about eighty pounds per square foot, or 0.055 of a pound per square inch (see Trautwine's tables). This would be balanced by a water-column of $1\frac{1}{2}$ inches in height; so that a trap of $\frac{3}{4}$ -inch depth of seal would barely be forced by such pressure, for when a trap is forced the water that is depressed on one side must pile up on the other, and if the trap is of uniform section the height of the column to be thus supported is just double the depth of the seal. It seems absurd to suppose that any conditions so favorable to the effect of wind-pressure can exist where soil-pipes are wide open to the air at top and bottom of the house.

As to the effect of "extremely low temperatures" in forcing traps, the only effect possible in this direction from this cause must arise from the difference in tension of the air within and without the house at the same moment, arising from such difference of temperature and the height of the chimneys by which the atmospheric pressure can be transferred from without the house to its interior. Let us suppose a house is heated to 80° through its whole interior while the outer air is 20° below zero, the difference in temperature is 100° . Suppose the chimney is sixty feet high and the house-walls as tight as a glass bottle, the difference in tension between the air in the lower story of such a house and that outside will then be equivalent to the weight of a column of air $60 \times \frac{100}{490} = 12.2$ feet in height. Dry

air at the temperature of 20° below zero has a weight of about 620 grains per cubic foot. A column 12.2 feet high would, therefore, exert a pressure on its base per square inch of $\frac{12.2 \times 620}{144} = 52.5$ grains. This would bal-

ance a water-column of only two-tenths of an inch in height! and as we have no houses as tight as glass bottles, the pressure resulting from such differences of temperature must be even less than this, being sensibly reduced by leakage of air through cracks and the friction of the rising column in the chimney.

In fact, our correspondent's fears seem to be without substantial foundation. We do not dispute the facts he alleges, but we think they are undoubtedly to be attributed to some circumstances affecting the case which escaped his attention—that is to say, we are skeptical about attributing the disturbances he noticed to the causes he alleges, and still have some confidence in traps with from $1\frac{1}{2}$ to 2 inches depth of seal when ventilated.]

VENTILATING A SHOW-WINDOW.

NEW WESTMINSTER, September 8, 1886.

SIR: Will you please give me information on ventilating a window that when the gas is burning in it, steam forms so that you cannot see through? It is a show-window of a dry-goods house. I propose putting in a ceiling-ventilator and running the pipe through the roof.

Yours truly,
E. W. CARROLL.

[You do not state the cause of the formation of the steam in the window or at what seasons of the year it appears. Any form of ventilation wherein the air will pass in at the bottom and out at the top will do much to regulate the hygrometric state of the confined air and make it the same as the ambient atmosphere.

If in winter time you have fog or hoar-frost on the glass, from the air of the store containing moisture in excess of the dew-point in the inclosed window, you must use artificial heat—either a row of gas-jets or a steam or hot-water pipe, or a small branch from the furnace terminating in the window-space.

Any house not sufficiently ventilated and warmed will have frost on the glass in cold weather.]

"A. 3RD SUBSCRIBER," of Toronto, should send us his name and address if he wishes a reply to his question about brass tube manufacturers. We do not answer inquiries unless they are accompanied with name and address of the questioner.

Gas and Electricity.

Illuminating Power of Gas in New York City.

Week ending	New York Gas-Light Company.	Manhattan Gas-Light Company.	Metropolitan Gas-Light Company.	Mutual Gas-Light Company.	Municipal Gas-Light Company.	Krickerbocker Gas-Light Company.	Equitable Gas-Light Company.
September 25....	25.87	21.67	22.48	30.85	30.33	22.86	32.09

E. G. LOVE, Ph.D., *Gas Examiner.*

DURING a thunder shower at Waupaca, Wis., September 27, the electric-light wires emitted violent electric sparks.

THE *Electrician* says: It is estimated that up to the present time not less than 14,000 horse-power, derived from water-falls, is in use in the United States and Canada for driving dynamo-machines. Nearly the whole of this power is employed for arc-lights.

A SYNDICATE made a proposition to Philadelphia Councils last Monday, offering to lease the gas-works for a term of years, paying a yearly rental of \$1,000,000, and reducing the price of gas to consumers by \$200,000 a year. They will spend \$3,000,000 within five years in improvements.

THE council of Elgin, Ill., has voted a franchise to George B. Dunne to lay mains and supply gas to consumers. It is provided that the price shall not exceed \$1.50 per 1,000 cubic feet, with a present rebate of twenty-five cents per 1,000 cubic feet if bills are paid before the 10th of the month, to increase to fifty cents after there shall have been 500 consumers.

THE *Journal of Gas-Lighting* mentions an article on the "Cost of Gas Production in England and on the Continent" which recently appeared in a technical journal of Barcelona. Among other things it is stated that in France, according to the statistical data of M. Schmitz, the average loss by leakage is 12.64 per cent. of the gas manufactured. The Paris Gas Company lost in 1856, 14.95 per cent.; in 1869, 8.58 per cent.; and in 1882, 6.79 per cent. In Germany the loss is 8.23 per cent. In London it was 8.75 per cent. in 1874, and 5.64 per cent. in 1878. The article gives a detailed estimate of the cost of manufacture by the Paris Gas Company in 1883, from which it appears that the gross cost was 56.18 pence per 1,000 feet, and the net cost, allowing for residuals, etc., was 32.26 pence, or about 65 cents, per 1,000 feet.

AT the Birmingham meeting of the British Association, Mr. J. W. Swan read a paper on "Improvements in Electric Safety-Lamps," in which he described certain improvements made in the safety-lamp exhibited by him at the meeting last year. He finds that he can obtain an average light of one candle during twelve hours, and 1½ candles during nine hours, from a battery which, with the appurtenances, weighs altogether 6¼ pounds. With a different lamp-filament the same battery will give more light for a shorter time or less light for a longer time than that mentioned. The battery-cells consist of a "central solid cylinder of peroxide of lead, with a conducting core of lead wire, fixed concentrically by means of guide-rings of India rubber, within a tube of lead, the internal surface of which is in the spongy state. The annular space between the peroxide-of-lead cylinder and the lead tube is filled with dilute sulphuric acid. Four such elements are fitted into four ebonite-lined holes in a block of wood saturated with paraffin." The connecting wires are covered with India rubber, and embedded in the wood. The new battery is charged without removing the cover. Where several hundred lamps are in use the total cost per lamp will not exceed fivepence per week, which includes renewal of lamp-bulbs, fuel, etc. In some forms of the lamp the light is fixed upon the top of the case, while in others it is fixed upon the side as a bull's-eye. The inventor has also attached a fire-damp indicator.

CANNED FOODS NOT AFFECTED BY HEAT AND COLD.

THE following replies to inquiries by the editor of the *American Grocer* have been received, regarding the effect of extreme heat and cold on canned foods.

General Sir Garnet Wolseley, commander of the English troops in the Soudan Campaign, writes:

HORSE GUARDS, WAR OFFICE, }
LONDON, S. W., 1st September, 1886. }

SIR: I received your letter of the 11th August, in which you request to be furnished with my opinion "as to the value of canned food as army supplies and as to the action of extremes of heat upon its quality, and whether it in any way affected its condition as regards texture or flavor during the expedition to the Soudan."

In reply I beg to inform you that I have called upon a military medical officer, Surgeon-Major W. Simson Pratt, M. D., whose experience and judgment may be safely relied on to furnish a report upon this question, and I have much pleasure in subjoining his statement for your information:

"Taking my experience in India and the late Nile Expedition, in which the test to tinned provisions was exceptionally severe from continued exposure to the powerful direct rays of the sun, I have found that tinned provisions, meat, and vegetables, put up separately, or combined in the form of soups, are practically undamagable by any climatic heat, provided the following conditions are carried out:

1. Provisions to be of best quality.
2. To have received proper amount of cooking before the tin is closed.
3. To be put up 'in vacuo' in perfectly sound, air-tight tins.

"I believe that any failure that occurs is due to the neglect of one or all of these conditions. Given these conditions, nothing can be more admirable; failing them, nothing more deleterious.

"I mention this more particularly as there is undoubtedly a large quantity of inferior and carelessly prepared tinned provisions in the market and the labels of well-known makers unscrupulously used.

"I think the main fault in the cooked meat is that it is overcooked. A less amount of cooking would answer all preservative requirements, and render the meat more palatable, both cold and after further cooking.

"The only class of provisions that, in my experience, suffers from great heat is that of uncooked articles, such as butter, cheese, and some forms of potted meats.

"Of course, once the tin is opened the things last much longer in cold weather, and last better in hot dry weather than in moist heat. In this last case the provisions must be used immediately."

I am sir, your obedient servant, WOLSELEY, A. G.
Lieutenant Greely, commander of the late Arctic Expedition, writes:

"Apples, peaches, pears, rhubarb, green peas, green corn, onions, potatoes, and tomatoes were all subject to extreme temperatures (over 60° below zero) and were solid for months at a time. The second summer they thawed, the following winter froze solid again. All the articles named presented the same appearance as though freshly canned, and their flavor was as good when the last can was eaten as in the first month. It should be understood that these were first-class canned goods, and from dealers of standing and reliability. Cranberry sauce, preserved damsons, preserved peaches and fruit butters suffered certain changes from candying, etc., which detracted somewhat from their flavor, though not materially so. Dealers in such preserves predicted that such conditions, and changes would occur. I had also canned turnips, squash, beets, and carrots, as well as pineapples, cherries, grapes, clams, shrimps, and crabs, which, although not subjected to such extreme temperatures as the foregoing, yet froze and thawed repeatedly without injury. No can of any kind, except a few—say half a dozen of fruit butters—was ever burst by action of cold or heat. No illness of any kind occurred prior to our retreat, and those most inclined to canned fruits and vegetables were the healthiest and strongest of the party. I have written thus fully in answer to your letter from my conviction that the excellent quality and variety of canned provisions contributed materially to the unequalled health of my command during the two years we passed in unparalleled high latitude. The importance of good canned fruit and vegetables to parties unable to obtain the fresh article cannot be overrated, and so I speak with no uncertain tone on the subject. Sincerely yours,

"A. W. GREELY, U. S. A."

SANITARY MATTERS IN AUGUSTA, GEO.

THE message of the Mayor of Augusta, Geo., with accompanying documents, for the year 1885, shows that the authorities of that city are doing good work in improving the healthfulness of the place. Mr. May, the Mayor, pays a deserved compliment to the President of the Board of Health, Dr. Eugene Foster, declaring that he knows no officer of the municipality who devotes more time and attention to his work or who deserves more commendation at the hands of the public. The Mayor asks the citizens of Augusta to read the report of the Board of Health and to examine into its work, which he commends to them for earnest aid and co-operation. The report of the board, which is one of the appended documents, shows that they have constructed 4,534 feet of pipe sewers at a cost of a little less than thirty cents per foot.

Ten thousand dollars were allowed the Board of Health for remodeling, perfecting, and extending the sewerage of the city, and on this basis work was commenced in 1885,

and is still in progress. It was a wise appropriation, for the sewerage of Augusta was in very bad condition. The death-rate for the year was the smallest in the history of Augusta, being 21.33 per thousand. It is to be hoped that within the next five years it will be reduced to 17 per thousand, and there seems to be no reason why this should not be effected.

Patents.

- 848,948. Steam-Trap. James H. Blessing, Albany, N. Y. Filed July 29, 1886. Issued September 14, 1886.
- 848,951. Joint for Gas-Mains. Edmund C. Converse, Pittsburg, Pa. Filed February 16, 1886. Issued September 14, 1886.
- 848,958. Covering for Steam-Pipes. Martin Flegle, Minneapolis, Minn. Filed March 8, 1886. Issued September 14, 1886.
- 848,959. Covering for Steam-Pipes, Boilers, Etc. Martin Flegle, Minneapolis, Minn. Filed March 15, 1886. Issued September 14, 1886.
- 848,989. Water-Heater. Frederick W. Momburg, Sauk Rapids, Minn. Filed November 27, 1885. Issued September 14, 1886.
- 848,998. Gas-Engine. James F. Place, New York, N. Y. Filed February 3, 1886. Issued September 14, 1886.
- 848,999. Gas-Engine. James F. Place, New York, N. Y. Filed February 17, 1886. Issued September 14, 1886.
- 849,080. Urinal. Ezekiel C. Condit, Kansas City, Mo. Filed March 16, 1886. Issued September 14, 1886.
- 849,089. Steam-Boiler. Henry C. Goulding, New York, N. Y., assignor to Milton W. Hazelton, same place. Filed April 10, 1886. Issued September 14, 1886.
- 849,048. Circulation of Feed-Water in Multitubular Upright Boilers. William D. Hooker, St. Louis, Mo. Filed January 27, 1886. Issued September 14, 1886.
- 849,047. Double-Acting Pump. William D. Hooker, St. Louis, Mo. Filed February 6, 1886. Issued September 14, 1886.
- 849,081. Preventing the Obstruction of Streets at Fires. Julius R. Meyers, San Francisco, Cal. Filed May 21, 1886. Issued September 14, 1886.
- 849,089. Metallic Lathing. Benjamin Scarles, Clinton, Mass., assignor to the Clinton Wire Cloth Company, same place. Filed July 17, 1886. Issued September 14, 1886.
- 849,074. Elevator. Philander Baker, Roxbury, Mass. Filed February 4, 1884. Issued September 14, 1886.
- 849,101. Filtering Apparatus. John Howes, Worcester, Mass. Filed July 25, 1885. Issued September 14, 1886.
- 849,148. Pipe-Coupling. John L. Duff, Sago, Ohio. Filed February 18, 1886. Issued September 14, 1886.
- 849,178. Cooling Air and Apparatus Therefor. Stanislas H. Rouart, Paris, France. Filed December 26, 1884. Issued September 14, 1886. Patented in France September 27, 1882, No. 151,199; in Belgium October 28, 1882, No. 59,403; in England November 1, 1882, No. 5,219; in Germany November 7, 1882, No. 23,601, and in Austria-Hungary February 3, 1883, No. 37,332.
- 849,181. Feed-Water Heater and Purifier. William J. Smith, San Francisco, Cal. Filed March 15, 1886. Issued September 14, 1886.
- 849,202. System of Water-Distribution. George B. Bassett, Watertown, N. Y. Filed February 27, 1886. Issued September 14, 1886.
- 849,206. Hydrant. Thomas K. Christie, Detroit, Mich. Filed February 4, 1886. Issued September 14, 1886.
- 849,280. Hydrant. John Mead, Detroit, Mich. Filed February 25, 1886. Issued September 14, 1886.
- 849,298. Water-Closet. William H. Umpleby, Trenton, N. J. Filed January 9, 1886. Issued September 14, 1886.

(For additional Patents, see page 425.)

IN some remarks on the death-rate of New Haven, Conn., for the month of August, Dr. C. A. Lindsley, Health Officer, notices that the rate is slightly above the usual mortality of that month. He then makes the following comments of general interest: "The chief interest, therefore, lies in the study of the conditions under which the deaths of children (to which the increased rate is chiefly due) occur. The following statement is in exact agreement with the observation of previous summers for several years. It shows how definitely the deaths of the little ones are associated with insanitary conditions about their houses, and it shows with equal force how exempt from fatal intestinal diseases are those fortunate babies who live in houses with good sanitation. There were thirty-two deaths in August from infantile diarrhoea. Of these the homes of only four have not been inspected. Of the remaining twenty-eight we have written reports in the office, and they are as follows: In twenty-seven of twenty-eight there was a privy in use in the yard. In the only case in which there was none the deficiency was supplemented by overcrowding, there being fifteen families in a block of tenements. In twenty-two of the twenty-six there were in addition to the privies the densely local abomination, the cesspool. In six of these the situation was rendered worse by untrapped sinks, and in one other by a leaky drain. In eighteen of these houses well-water was the only supply, and every well was in close proximity to a privy and cesspool, often between the two. There were no other deaths from infantile diarrhoea reported to the registrar in August. Of the thirty-two the homes of twenty-eight have been inspected, and it is on our records that twenty-seven of the twenty-eight were living over privy-vaults and cesspools, and thirteen of them drinking the soakage of these filth-pits from the other hole in the ground called the well. Comment on the above facts seem unnecessary. The most obvious and positive influences which these facts teach is that fatal infantile diarrhoea is limited to those who are exposed to the exhalations of human excrement collected in masses in the ground, and that the large portion of the population not so exposed are exempt from these intestinal disorders in a fatal form. That is the practical lesson of the mortality registration in New Haven in August."



For works for which proposals are requested, see also the "Proposal Column," pages 414 and 425

CONSTRUCTION.

PUMPING-ENGINES WANTED.—In our Proposal Column will be found an abstract of proposals for pumping-engines for the Cleveland, O., Water-Works. John Whitelaw is Superintendent and Engineer.

WATER-WORKS WANTED.—The taxpayers of Iliou, N. Y., met on September 22 to receive and accept the report of the committee on water-works. This recommends that the trustees be authorized to call a special election for the purpose of deciding whether the taxpayers want water-works, and if so whether the village shall construct such works or grant the franchise to an outside water company.

NEW HAVEN, CONN.—At a meeting of the Water Committee, September 21, Corporation Counsel Driscoll was instructed to be ready to give information to the committee at their next meeting on the best course to pursue to secure an adequate supply of water. New water-mains will also be wanted, and estimates of their size and quantity will be given to the committee at the next meeting.

AUSTIN, TEX.—At the meeting of the City Council, September 20, it was resolved to submit to popular election, December 6, 1886, a proposition to raise \$350,000 on city bonds for the purchase of the existing water-works or construction of new ones, and the introduction of a system of sewerage. Dr. Cummings is Chairman of the Special Committee of the Aldermen which has had some details of the scheme in charge.

WORCESTER, MASS.—The City Council has directed the City Engineer to investigate the matter of treatment of the city sewage.

The Park Commissioners have reported on an extension of parks, with estimate of cost at \$150,000.

WHITMAN, MASS.—The water-commissioners are considering the advisability of constructing a filter-basin near Hobart Pond, and establishing a pumping-station.

ORLANDO, FLA.—It is expected to build water-works. A Philadelphia firm has offered to construct them; cost about \$150,000.

ROCHESTER, N. Y.—The Executive Board has awarded the contract for a wrought-iron bridge over the canal at Exchange Street to John F. Alden at \$3,850. James D. Casey receives the contract for a pipe-sewer in Brown Street at \$1,456.30.

It appears likely, from reports of the last meeting of the Executive Board, that Chief Engineer Tubbs will need a quantity of water-pipe to complete the laying of 34,000 lineal feet awarded to Contractor Reid. The city is not satisfied with the rate of progress made by the contractor, and proposes to buy the pipe and have it laid under direction of Chief Engineer Tubbs.

MILWAUKEE, WIS.—Bids are wanted for the construction of a stone and iron water-tower for the new North-Western High Service Pumping Station. Address A. H. Scott, Assistant City Engineer.

The Milwaukee Cremation Society effected a permanent organization September 21, 1886, and elected the following officers: President, F. B. Huchting; Vice-President, Emil Waller; Secretary, John Uhrlich; Treasurer, Otto Gallun; Trustees, Phillip Schlosser, Adolf Meinecke, Otto Zwietusch. A constitution was adopted. Plans for the crematory and the chapel were submitted for inspection.

HARLEM RIVER TUNNEL.—At the meeting of the Board of Street Openings of this city September 23, a plan was presented for tunnel under Harlem River at Seventh Avenue. The matter was adjourned to the meeting of this week.

STEAM-HEATING APPARATUS WANTED.—The City Clerk of St. Paul, Minn. (L. A. Prendergast), will receive proposals, until October 5, for steam-heating apparatus for the city hospital buildings. Plans are at the office of C. T. Mould, architect, 454 Drake Block.

NORTHFIELD, MINN.—The Surveyor appointed by the Board of Trade to make a survey and report estimates for a water-supply has reported on three plans, estimating the cost at \$33,000, \$37,000, and \$40,000. No action has yet been taken.

CHELSEA, MASS.—On September 23 City Councils received and adopted a report presented by the Water Commissioners in favor of providing a high-service-water-supply according to plans of Crafts & Forbes, hydraulic engineers, of Boston. They favor a reservoir on Powder-Horn Hill, and the laying of 10-inch cast-iron pipes for high service, the reservoir to be built on the summit of Powder-Horn Hill, with a capacity of 1,000,000 gallons, the surface of water when full about 198 feet above mean high water; a two-story brick engine-house to be erected on the lot of land at the corner of Park and Hawthorn Streets with the pumping apparatus. The estimated costs are as follows: Engine-house, \$4,000; pumping apparatus, \$3,000; reservoir, \$4,000; pipe, \$600; gates and branches, \$500; pipe, \$450; contingencies, \$1,030; annual expenses, fuel, \$750; engine, \$800; waste, oil, and repairs, \$150; total, \$22,500. The land on Powder-Horn Hill, 6½ acres, the commissioners reported would cost \$12,000, making the total cost of the engine-house, land included, \$40,000. The order was offered appropriating \$40,000 for the high water-supply, as recommended by the commissioners. Chairman Stebbins, of the Board of Water Commissioners, can give further information.

KENDALLVILLE, IND.—The question of a public water-supply is being agitated here.

NEW YORK CITY.—A new police station will be built for the Twenty-eighth Precinct. The contract was last week awarded to James H. Brady at \$82,986.

COLUMBUS, O.—The State Board of Public Works is preparing plans and specifications for the improvement of the Ohio Canal near Portsmouth.

NEW YORK CITY.—The Commissioners of Charities and Correction are preparing to begin extensive improvement and building operations on Riker's Island, including the building of a new penitentiary. Plans have not yet been adopted.

LANSINGBURG, N. Y.—The Water Commissioners have awarded a contract to Sherman & McDonough, of West Troy, to build sewers in Sixth and Ninth Streets, at \$6,170.51, with laterals at 42 cents per foot.

BROOKLYN.—Proposals for removing garbage have been received by the Commissioners of Health and City Works. For the period of five years, 1887-91, the totals were: Daniel Gallagher, \$212,000; John H. O'Rourke, \$233,000; Henry Berau, \$273,000; John Anderson, \$280,000; George F. Swift, \$300,000; Hugh S. Blake, \$310,000; J. P. Cranford, \$320,000; Robert Furey, \$341,000; Seth L. Keeny, \$375,000. For the last three months of 1886 the bids were: Daniel Gallagher, George F. Swift, John H. O'Rourke, \$15,000 each; Henry Berau, \$17,000; Hugh S. Blake and John Anderson, \$18,000 each; Seth L. Keeny, \$20,000.

CLARINDA, IOWA.—The following bids for constructing water-works were received by A. A. Richardson, Consulting Engineer, September 9: H. R. Worthington, New York and St. Louis, Machinery, \$5,784 and \$4,021. Boilers: Brownell & Co., Omaha, Neb., \$1,285. Machinery: Holly Manufacturing Company, Lockport, N. Y., \$6,250 and \$5,300; Gordon & Maxwell, Hamilton, O., \$4,950 and \$4,200; Deane Steam-Pump Co., Holyoke and St. Louis, \$6,277 and \$7,475; Pond Engineering Company, St. Louis, \$8,726 and \$6,794; Smith & Vail Pump Company, St. Louis, \$3,987.36. Pipe and Specials: National Tube-Works (kalamein pipe), Chicago, \$1,635.70; Cincinnati & Newport Iron and Pipe Company, \$40.60 per ton and \$70 per ton; H. A. Keefe, Kansas City, Mo., \$39 per ton. Hydrants and gates: National Tube-Works, Chicago, Ill., \$1,703.20; Chapman Valve Co., Indian Orchard, Mass., hydrants \$30, gates \$9.57 to \$45.40; Galvin Brass and Iron Works, Detroit and Chicago, \$1,500; Whittier Machine Company, Boston, hydrants \$32.30, gates \$8.63 to \$41.25; Kauffler & Bossler, St. Louis, hydrants, \$25; Crane Bros., Omaha, Neb., \$1,749.25; Frontier Works, Pittsburg, Pa., hydrants \$25, gates \$8.50 to \$28.36; H. A. Keefe, Kansas City, hydrants, \$27.50. Pipe-laying: W. J. Cooper, \$2,784. Tubular-well system: James Burns, Lincoln, Neb., \$2,844.40; W. J. Cooper, Lin-

coln, Neb., \$3,000; Dennis & Crowell, Muscatine, Iowa, lump bid, excepting pumping machinery, engine-house, stack, and well, \$26,400; A. L. Strang & Co., Omaha, lump bid, excepting engine-house, stack, and wells, \$29,021.17; W. J. Cooper, Lincoln, Neb., lump bid, excepting engine-house and stack, \$33,995; G. C. Morgan, Chicago, Ill., complete work, \$38,323; Fairbanks & Co., lump bid, excepting engine-house, stack, and wells, \$30,091.

Bids accepted: Crane Bros., Omaha, material, \$1,485; William Smith, labor, \$384; H. R. Worthington, machinery, at \$4,021; Brownell & Co., boilers, at \$1,285; and Galvin Brass and Iron Works, for hydrants and gates, \$1,500.

SARATOGA, N. Y.—The water-supply of the southern part of the village is insufficient, and it is suggested to provide pumping machinery and lay mains to give that section an independent supply.

BATH, N. Y.—Horace Andrews, civil engineer, has prepared sewerage plans for the special committee on sewerage.

LIGHTING HELL GATE.—Press dispatches from Washington state that the Light-House Board has decided to recommend to Congress the establishment of light-houses along the new Hell Gate channel in the East River approaches of this city.

LITCHFIELD, CONN.—The Committee on Water-Supply and Sewerage has received a report on the cost of bringing water into the village from Dog Pond, placing it at \$50,000, the cost of water from wells near Little Pond at \$36,000, with \$2,000 per annum for running expenses. Mr. Sanford, of the committee, reports a sewerage scheme costing about \$30,000.

GOVERNMENT WORK.

NORFOLK, VA.—Abstract of proposals for furnishing, building, and delivering a steam-boiler, opened September 20, 1886, by Capt. F. A. Hinman, Corps of Engineers, U. S. A.: John C. Froehlich & Co., Baltimore, Md., \$730; Henry Warden, Philadelphia, Pa., \$750; Theodore Smith and Henry Smith, Jersey City, N. J., \$695; H. T. Morrison, Petersburg, Va., \$583.80; S. C. Forsaith Machine Co., Manchester, N. H., \$614; E. J. Codd & Co., Baltimore, Md., \$1,042; West Point Engine and Machine Co., West Point, Pa., \$495.

BIDS FOR HARBOR WORK.—Bids for work on certain harbors were opened by Captain Charles E. L. B. Davis, U. S. Engineers, at Milwaukee, September 23, as follows:

Extension of piers and construction of superstructure at Ontonagon Harbor, Mich.—John H. Gillett, Marquette, \$13,146; A. S. Bretherton, Jackson, Mich., \$2,361; William T. Casgrain, Milwaukee, \$12,385.

Extension of piers and construction of superstructure at Port Washington Harbor, Wis.—Knapp & Gillen, Racine, \$3,266.50; Truman & Cooper, Manitowoc, \$2,825; A. S. Bretherton, Jackson, Mich., \$3,810; William T. Casgrain, Milwaukee, \$3,254.

Extension of piers and construction of superstructure at Sheboygan Harbor—Knapp & Gillen, Racine, \$12,050.60; Schwartz & Berner, Green Bay, \$11,892.10; Truman & Cooper, Manitowoc, \$10,791.60; A. S. Bretherton, Jackson, Mich., \$17,034.60; William T. Casgrain, Milwaukee, \$14,469.

Extension of piers and construction of superstructure at Manitowoc Harbor—Truman & Cooper, Manitowoc, \$14,037; Schwartz & Berner, Green Bay, \$15,744; Knapp & Gillen, Racine, \$16,368; A. S. Bretherton, Jackson, \$22,779; William T. Casgrain, Milwaukee, \$20,255; Greve & Folge, Manitowoc, \$15,548.50.

Extension of piers at Kewaunee Harbor—John Weabetz Kewaunee, \$8,492.60; Truman & Cooper, Manitowoc, \$8,223.70; Schwartz & Berner, Green Bay, \$7,265.32; Knapp & Gillen, Racine, \$7,303.80; William T. Casgrain, Milwaukee, \$8,732.20.

Extension of piers at Grand Marais Harbor, Mich.—Truman & Cooper, Manitowoc, \$27,053; Schwartz & Berner, Green Bay, \$28,288.50; A. S. Bretherton, Jackson, Mich., \$28,534; John H. Gillett, Marquette, \$31,700; William T. Casgrain, Milwaukee, \$29,929; Castle Sutherland, East Saginaw, \$23,140.

MOBILE, ALA.—The following bids for dredging in Mobile Harbor were received by Major A. N. Damrell, U. S. A., September 18: Peter Burke, Mobile, Ala., 11½ cents per cubic yard; George C. Fobes, Baltimore, Md., 10 cents; Rittenhouse Moore, Mobile, Ala.,

9½ cents; John Maguire, Mobile, Ala., 11¾ cents; S. N. Kimball, Apalachicola, Fla., 15 cents.

BALTIMORE, MD.—Synopsis of bids for 50,000 (more or less) roofing-slate, 10"x20"x¼", for Post-Office, etc., opened September 16: Eureka Slate Co., \$8.80 per 100; Washington Slate Co., \$7.96; Hartford Peach Bottom Slate Manufacturing Co., \$8.80; J. R. Williams & Co., \$5.88; William Williams, \$7.20, \$6.25, \$8.70.

BALTIMORE, MD.—Synopsis of bids for sheet-copper, 2,900 sheets, 14-ounce, 24"x48", tinned both sides, for Post-Office, etc., opened September 16: C. G. Hussey & Co., \$1.60 per sheet; Taunton Copper Manufacturing Co., \$1.60; Ansonia Brass and Copper Co., \$1.60; Baltimore Copper Rolling-Mill Co., \$1.50; New Bedford Copper Co., \$1.60; Detroit Copper and Brass Rolling-Mill, \$1.60; Park Bros. & Co., \$1.60.

WASHINGTON, D. C.—Synopsis of bids for plastering and stucco-work for office of Building for State, War, and Navy Departments: Smith & Crimp, Chicago, \$26,640.10; James Hughes, Washington, \$31,853.88; Gruver & Stickle, Washington, \$32,823.35; James Smith, Cleveland, O., \$37,681.20.

PHILADELPHIA.—Bids were opened at the United States Engineer's Office, on September 24, for dredging to be done in the Delaware and Schuylkill Rivers. For the removal of about 80,000 cubic yards in the Delaware River, west of Petty's Island, Frank C. Somers, of Philadelphia, bid 39½c. per cubic yard, and the American Dredging Co., of Philadelphia, 32c. per cubic yard. For the removal of about 80,000 cubic yards from three points on the Schuylkill River, P. Sanford Ross, Jersey City, N. J., 26c. per cubic yard; Richard M. Payn, Albany, N. Y., 19½c.; National Dredging Co., Wilmington, Del., 24c.; American Dredging Co., Philadelphia, 19c.; and Frank C. Somers, Philadelphia, 23½c. The American Dredging Co. was the lowest in each case.

RACINE AND KENOSHA HARBORS.—Bids were recently opened at the Engineer Office in Milwaukee for improving the harbors of Racine and Kenosha, Wis. For the work of cutting down and rebuilding 550 feet of a superstructure of the south pier at this port, the bids were: W. T. Casgrain, Milwaukee, \$10,475; Horatio Thuman and George Cooper, of Manitowoc, \$9,632.44; George H. Sager, Kenosha, \$9,500; H. B. Kerr & Co., of Chicago, \$8,905.16; C. H. Starke of Milwaukee, \$9,632.44; F. M. Knapp and E. Gillen, Racine, \$6,301.46. For the work of cutting down and rebuilding 408 feet of superstructure of the south pier at Kenosha Harbor, the following bids were received: W. T. Casgrain, Milwaukee, \$5,791; Horatio Thuman and George Cooper, Manitowoc, \$5,287.50; George H. Sager, Kenosha, \$5,120.40; H. B. Kerr & Co., Chicago, \$4,935.50; C. H. Starke, Milwaukee, \$5,287.50; F. M. Knapp and E. Gillen, Racine, \$4,088.15.

CHICAGO.—Contracts will soon be awarded on the St. Paul's Church, corner of Prairie Avenue and Thirtieth Street. Burling & Whitehouse are the architects.

THE NEW YORK Cable Railway Construction Company has filed articles of incorporation. It proposes to operate railways by stationary engines and cables. Among the incorporators are C. D. Ingersoll, D. Frank Lloyd, Henry L. Storke.

ALBANY, N. Y.—The labor disturbances in Albany, which have crippled building operations, are not likely to seriously affect the contractors, since all contracts taken this year, it is stated, were taken with the clause, "subject to strikes." No work is being done on the State Capitol, and the number of idle men in the city is very large. The lockout was ordered off Saturday evening, but the mechanics refused on Monday morning to go to work under the rules adopted by the master builders.

PERSONAL.

MR. JOHN B. STEBBINS, of Springfield, has been elected to the presidency of the Holyoke Water Company, succeeding Mr. George M. Bartholomew, defaulter.

MR. BENEZETTE WILLIAMS, C. E., of Chicago, has been associated with Mr. Rudolph Hering, Chief Engineer of the Drainage and Water Commission, as Consulting Engineer.

NEW CATALOGUES.

A PAMPHLET entitled "The Most Efficient Use of Steam in Electric Light and Power of Plants," as advocated by the Pond Engineering Co., of St. Louis, has been received. It illustrates engines and other appliances used in fitting up electric-light plants sold by this firm, with information on this subject.

PATENTS.

(Continued from page 423.)

348,493. Device for manufacturing asphaltic concrete for paving purposes. Francis V. Greene, New York, N.Y., assignor to the Barber Asphalt Paving Company, Washington, D. C. Filed May 24, 1886. (No model.)

Claim.—1. As an improvement in the art of laying asphalt pavements, the plant herein described for making the asphalt concrete at the point where it is laid, the same consisting of the sand-heater, asphalt-melter, concrete-mixer, and engine, all mounted on wheels and adapted to be used jointly and moved from one point to another, as set forth.

2. In a plant for making asphalt concrete for paving purposes, the platform A' of the mixing-machine, provided with the elevator U, hopper V, and track or way N', in combination with the heater A, mixer C, and engine D, arranged as described, and for the purpose set forth.

3. In a plant for making asphalt concrete for paving and other purposes, the portable sand-heater A, consisting of the revolvable drums H, mounted in the casing E and operated as described, and provided with the screen portion O, in combination with the chute T and elevator U, as set forth.

4. In a plant for making asphalt concrete for paving purposes, the portable platform or truck A', carrying the mixing-chamber C, provided with the elevator U, hopper V, measure C, and the track or way N', adopted to support the carriage O', and measure P', as set forth.

5. In a device for melting asphaltum or other bituminous substances, the removable guard or shield A', adopted to be interposed between the fire of the furnace and the bottom of the melting-tank, as set forth.

ANNOUNCEMENT.

The publication of the sixth revised edition of the U. S. Pharmacopoeia (1880), containing as it does more strict requirements for the purity and strength of pharmaceutical preparations, has been followed in some States of the Union by the enactment of laws against the adulteration of drugs, which laws make the Pharmacopoeia the official standard.

In accordance with our established policy we shall, as in the past, use our best endeavors to furnish only such preparations as shall meet pharmacopoeial requirements. We are heartily in sympathy with all efforts which aim to improve the quality of medicines, and shall continue as heretofore to exclude all low grade and inferior articles and to use our influence to promote the sale and use of pure drugs and medical preparations.

W. H. SCHIEFFELIN & CO.

New York:
175 WILLIAM STREET.

Paints.

ANNOUNCEMENT.

WE desire to call attention of consumers to the fact that we guarantee our ready-mixed paints to be made only of pure linseed-oil and the most permanent pigments. They are not "Chemical," "Rubber," "Patent," or "Fire-proof." We use no secret or patent method in manufacturing them by which benzine and water are made to serve the purpose of pure linseed-oil. Sample cards containing 50 desirable shades sent on application.

F. W. DEVOE & CO.,

FULTON ST., COR. WILLIAM, Established 1852,
NEW YORK. ARTISTS' MATERIALS
FINE VARNISHES.

LIEBIG COMPANY'S EXTRACT OF MEAT. Finest and cheapest Meat Flavoring Stock for Soups, Made Dishes, and Sauces. Annual sale 8,000,000 jars.

LIEBIG COMPANY'S EXTRACT OF MEAT. An invaluable tonic. "Is a success and a boon for which nations should feel grateful."—See "Medical Press," "Lancet," etc.

Genuine only with the fac-simile of Baron Liebig's Signature in Blue Ink across the Label. The title "Baron Liebig" and photograph having been largely used by dealers with no connection with Baron Liebig, the public are informed that the Liebig Company alone can offer the article with Baron Liebig's guarantee of genuineness.

LIEBIG COMPANY'S EXTRACT OF MEAT. To be had of all storekeepers, Grocers, and Chemists. Sole Agents for the United States (wholesale only) C. David & Co., 9 Fenchurch Avenue, London, England.

Sold wholesale by James P. Smith, Park & Tilford, Acker, Merrill & Condit, McKesson & Robbins, Thurbur, Whyland & Co., Francis H. Leggett & Co., Chas. N. Crittenton, and W. H. Schieffelin & Co.

PATENTS.

348,523. Apparatus for refrigerating rooms. Clinton C. Hutchinson, Philadelphia, Pa., assignor to the I. P. Morris Company, same place. Filed November 20, 1885. (No model.)

Claim.—In an apparatus for cooling rooms, etc., the combination, with a suitable refrigerating-machine, of a system of circulating-pipes for refrigerant arranged within said room and communicating with said machine, a receptacle wholly or partially surrounding said pipe, and a body of congealable liquid contained in said receptacle and in contact with said piping, whereby during intermittent operation of said machine a reservoir of refrigerant is maintained within said room, substantially as set forth.

358,534. Filter. Henry Roeske, Philadelphia, Pa., assignor of one-half to Manuel J. Nascimento, same place. Filed June 18, 1885. (No model.)

Claim.—1. In a filter, the drum A, having the pipes B and B', entering the said drum on the opposite ends thereof, and having their inner closed ends securely fastened together, and the perforated elbow-pipes D and D' within said drum and leading from said pipes B and B', all of said parts arranged, combined, and operating substantially as described.

2. The drum A, having filtering material loosely placed therein, in combination with the pipes B and B', connected at their inner closed ends, and provided with the perforated elbow-pipes D and D', respectively, and standards C, having bearings for said pipes B and B', all of said parts being arranged, combined, and operating substantially as and for the purpose set forth.

3. The rotatable drum A, provided with the inlet and outlet pipes B and B' at opposite ends, the said pipes having their inner closed ends connected and their outer ends forming journals for the said drum with bearings in the standards C, the said drum having within the same filtering material, the perforated elbow-pipes D and D', connected to said inlet and outlet pipes, all of said parts being arranged, combined, and operating substantially as and for the purpose set forth.

348,531. Automatic sprinkler. William T. Montgomery, Wakefield, assignor to the Star Manufacturing Company, Boston, Mass. Filed January 2, 1886. (No model.)

LATE NEW YORK BUILDINGS.

4th av, s w cor 119th st, 4 br tens; total cost, \$50,000; o, John M. Hyde; a, A. Spence.

1st av, e s, 75 s 71st st, br flat and store; cost, \$30,000; o, T. Fitzgerald; a, A. B. Ogden & Sons.

St. Ann's av, w s, 50 w 146th st, br ten; cost, \$11,000; o, William Beaman; a, H. S. Baker.

Proposals.

(Continued from page 414.)

PROPOSALS FOR BUILDING A TIMBER AND STONE CRIB, AND FOR RIP-RAPPING AT U. S. FISH COMMISSION BASIN, SUSQUEHANNA RIVER.

U. S. ENGINEER OFFICE,
378 St. Paul St., Baltimore, Md., Sept. 27, 1886.

Proposals for building a stone and timber crib, and for placing rip-rap against some old cribs, at the U. S. Fish Commission Basin, Susquehanna River, below Havre de Grace, Md., will be received at this office until noon of October 11, 1886, and opened immediately thereafter. Blank forms, specifications, and all necessary information can be had by application to this office.

WM. P. CRAIGHILL,

Lieut. Col. of Engineers, U. S. A.

PROPOSALS FOR PIPE-COVERING.

Office of Building for State, War and Navy Departments, WASHINGTON, D. C., September 18, 1886.

Sealed proposals for furnishing, delivering, and applying hair-felt covering for hot-water and steam pipes in the West and Centre Wings of the Building for State, War and Navy Departments, in this city, will be received at this office until 12 M., on MONDAY, the FOURTH day of October, 1886, and opened immediately thereafter in presence of bidders.

Specifications, general instructions for bidders, and blank forms of proposal will be furnished to parties regularly engaged in the manufacture or application of this material on application to this office.

THOS. LINCOLN CASEY, Col. Corps of Eng'rs.

OFFICE OF POST QUARTERMASTER,
FORT HAMILTON, N. Y. H., September 14, 1886.

Sealed proposals in triplicate, subject to usual conditions, will be received at this office until 12 o'clock M., Thursday, October 14, 1886, at which time and place they will be opened in presence of bidders for constructing a water-closet building at Fort Hamilton, N. Y. H. Blanks and instructions to bidders furnished on application. Envelopes containing proposals to be marked "Proposals for constructing a water-closet building," and addressed to the undersigned.

The right to reject any or all proposals is reserved to the Government.

FRANK THORP,

First Lieut. & R. Q. M. Fifth Artillery,
Post Quartermaster.

Proposals.

OFFICE OF POST QUARTERMASTER,
FORT HAMILTON, N. Y. H., September 14, 1886.

Sealed proposals in triplicate, subject to usual conditions, will be received at this office until 12 o'clock M., Thursday, October 14, 1886, at which time and place they will be opened in presence of bidders for connecting a water-closet building with the sewer and water system of the Post at Fort Hamilton, N. Y. H. Blanks and instructions to bidders furnished on application.

Envelopes containing proposals to be marked "Proposals for connecting a water-closet building," and addressed to the undersigned.

The right to reject any or all proposals is reserved to the Government.

FRANK THORP,

First Lieut. & R. Q. M. Fifth Artillery,
Post Quartermaster.

TO IRON MANUFACTURERS.

OFFICE OF THE LIGHT-HOUSE BOARD,
WASHINGTON, D. C., September 13, 1886.

Sealed proposals will be received at this office until 2 o'clock P. M., of Monday, the 4th day of October, 1886, for furnishing the materials and labor of all kinds necessary for the completion and delivery on the site of the metal work of the Anclote Keys Light-House, Florida.

Plans, specifications, forms of proposal, and other information may be obtained on application to this office.

The right is reserved to reject any or all bids, and to waive any defects.

STEPHEN C. ROWAN,

Vice-Admiral, U. S. Navy, Chairman.

IRON WORK, LEAVENWORTH, KANS.—Treasury Department, Office Supervising Architect, Washington, D. C., September 25, 1886. Sealed proposals will be received at this office until 2 P. M. on the 7th day of October, 1886, for furnishing and fixing in place the iron columns, girders and beams required for the Court House, etc., building at Leavenworth, Kans., in accordance with drawings and specifications, copies of which and any additional information may be had on application at this office or the office of the Superintendent. Bids must be accompanied by a certified check for \$300. M. E. BELL, Supervising Architect.

IRON WORK, ST. JOSEPH, MO.—Treasury Department, Office Supervising Architect, Washington, D. C., September 27, 1886. Sealed proposals will be received at this office until 2 P. M. on the 13th day of October, 1886, for furnishing and fixing in place the iron columns, girders, and beams required for the Post-Office, etc., building at St. Joseph, Mo., in accordance with drawings and specification, copies of which and any additional information may be had on application at this office or the office of the superintendent. Bids must be accompanied by a certified check for \$500. M. E. BELL, Supervising Architect.

ORDNANCE SUPPLIES for Rock Island, Ill., Arsenal. Until October 16. Address Col. T. G. Baylor, U. S. A., commanding Arsenal.

MASONRY, PLUMBING, CARPENTRY, ETC., of public school building on Starr Street, Brooklyn. Until October 5. Address William Harkness, Chairman of School Committee, Brooklyn, N. Y.

GRAVEL ROADWAYS, curbing and sewers. Until October 16. Quantities: 23,000 sq. yds. gravel roadway on Telford foundation; 25,000 sq. yds. gravelled road surface; 6,500 lin. ft. of wood curbing; 6,000 lin. ft. of pipe sewer. Address Bryan Callaghan, Mayor of San Antonio, Tex.

GRADING, CURBING, ETC., 2,000 lineal feet of Crawfish Pond, Cincinnati. Until October 18. Address Thomas G. Smith, President of Board of Public Affairs, Cincinnati, O.

FURNISHING TIMBER, Etc., to navy yards. Until October 15. Address D. B. Harmony, Acting Secretary of the Navy for Bureau of Construction and Repair, Washington, D. C.

RUBBLE STONE. 16,665 cubic yards of rubble stone and 5,500 cubic yards of large stone for Rouse's Point, N. Y. Until October 15. Address Major M. B. Adams, U. S. Engineers, Burlington, Vt.

BUILDING CRIB on Davis Island Dam. Until October 16. Address Lieut. Lansing H. Beach, U. S. Engineer Office, Cincinnati, O.

DREDGING, ETC. The dredging and removal of about 30,000 cubic yards of material from Scituate Harbor. Until October 13. Address Major G. L. Gillespie, U. S. Engineers, Post Office Building, Boston, Mass.

DREDGING in Newport Harbor, R. I., and Wareham Harbor, Mass. Until October 4. Address Col. George H. Elliot, U. S. Engineers, Newport, R. I.

MACADAMIZED ROADING for National Military Cemetery, Knoxville, Tenn. Until October 14. Address R. N. Batchelder, Deputy Q. M. General, U. S. A., Office of National Cemeteries, Washington, D. C.

DREDGING in Plymouth, Mass., Harbor, about 18,000 cubic yards of material. Until October 12. Address Major G. L. Gillespie, U. S. Engineer Office, Boston, Mass.

FURNISHING RUBBLE STONE, about 18,000 tons, in Newburyport, Mass. Until October 12. Address Major G. L. Gillespie, U. S. Engineer Office, Boston, Mass.

NEW BUILDINGS, including materials, for Reading Brewing Co. Until September 27. Address Board of Directors, 611 Penn Street, Reading, Pa.

HOVE TRUSS wooden bridge, 140 feet long, and 40 feet wide; also one bridge of same make, 140 feet long and 50 feet wide. Address T. A. Canty, City Clerk, East St. Louis, Ill.

PORCELAIN-LINED iron bath-tubs, mantels, hearths and grates, gas-fixtures, steam-heating apparatus for bath-house, concrete floors, water-hydrants and fire apparatus. Until October 11. Address Captain Charles H. Ingalls, A. Q. M., U. S. A., Hot Springs, Ark.

DREDGING in New London Harbor, Conn. Until October 11. Address Col. D. C. Houston, U. S. Engineers, Army Building, New York City.

Proposals.

REPAIRING AND EXTENDING dike on east bank of Hudson River at Lansingburg, N. Y. Until September 27. Address James Shanahan, Superintendent of Public Works, Albany, N. Y.

IMPROVEMENT of Manhattan Avenue, Jersey City. Until October 4. Address Board of Public Works of Jersey City, Thomas Jacob, Clerk.

TIMBER, ETC., for Bureau of Construction and Repair, U. S. N. Until October 15. Address D. B. Harmony, Acting Secretary of the Navy, Washington, D. C.

EARTH FILLING and stone paving for Davis Island, O., dam. Until October 19. Address Lieut. Lansing H. Beach, U. S. Engineers, Custom House, Cincinnati, O.

PUMPING-ENGINES. Until October 16. Two pumping-engines, capacity 14,000,000 gallons in 24 hours, against a maximum pressure of 100 pounds per square inch. Proposals for three types as follows: First, for two horizontal, compound, duplex, guaranteed to perform a duty equal to raising fifty million pounds of water one foot high with the steam generated by the consumption of 100 pounds of bituminous coal. Second, for two horizontal, compound, duplex, guaranteed to perform a duty of eighty millions under the same conditions as stated above. Third, for two vertical double-acting, compound, beam, and fly-wheel, guaranteed to perform a duty of not less than ninety millions, under the same conditions as above. An evaporation of nine pounds of water per pound of coal consumed will be guaranteed. The plunger speed for horizontal pumps shall not exceed 100 feet per minute, and for vertical pumps 150 feet per minute. The engine-room is 43x52 feet, and 40 feet high. Foundations will be furnished by the water-works. Proposals will not be entertained for any type of engine not now in successful operation for some public water-supply. The proposals to include all necessary steam-pipes and valves, all water-pipes, including suction and discharge mains to outer walls of engine-room, and one foot-valve of a size sufficient for the supply of both pumps. Approved engine-registers, steam, water, and vacuum gauges, and all tools necessary for the proper care and working of the engines. Also, two approved duplex boiler feed-pumps, with plungers not less than 6x10 inches. One engine, if of low-duty type, to be completed and erected within seven months from date of award of contract, and the second one (if the contract be awarded for two) two months later; if either of the high-duty types is adopted, two months' extension of time will be allowed. Bidders will state the price for one engine or two engines. Address John H. Whitelaw, Superintendent of Water-Works, Cleveland, O.

DREDGING in Kenyon's Bay, four channels, Lake Champlain, N. Y. Until October 6. Address Major M. B. Adams, U. S. Engineers, Burlington, Vt.

ERECTING HOSPITAL at Cleveland, O. Until October 9. Address Board of Infirmary Directors, L. S. O'Neil, Clerk.

CONSTRUCTING TANK-HOUSE for Reform School, District of Columbia. Until October 4. Address George W. Adams, President of Board of Trustees, Washington, D. C.

CONSTRUCTION AND REPAIR OF JETTIES at Sabine Pass, Tex. Money available, \$190,000. Until October 9. Address Major W. H. Heuer, U. S. Engineers, 63 Carondelet Street, New Orleans.

GRANITE FOR DRY-DOCK for Mare Island, Cal. Until October 13. Address D. B. Hanning, Chief of Bureau of Yards and Docks, Washington, D. C.

BUILDING COURT-HOUSE, Pulaski County, Ark. Until October 10. Address County Judge Hill. The architect is Max Orlopp, of Little Rock.

RUBBLE STONE, delivery of 150,000 tons. Until October 13. Address Major G. L. Gillespie, U. S. Engineers, Post-Office Building, Boston, Mass.

DREDGING in Bridgeport Harbor, Conn. Until October 11. Address Col. D. C. Houston, U. S. Engineers, Army Building, Houston and Greene Streets, New York City.

REMOVING DREW'S ROCK AND JETTY, Houston River, Conn. Until October 13. Address Col. D. C. Houston, U. S. Engineers, Army Building, Houston and Greene Streets, New York City.

REPAIRING DIKES in the Connecticut River above Hartford, Conn. Until October 13. Address Col. D. C. Houston, U. S. Engineers, Army Building, Houston and Greene Streets, New York City.

EXTENDING THE NEW HAVEN, CONN., BREAKWATER. Until October 13. Address Col. D. C. Houston, U. S. Engineers, Army Building, Houston and Greene Streets, New York City.

DREDGING in Norwalk River, Conn. Until October 11. Address Col. D. C. Houston, U. S. Engineers, Army Building, Houston and Greene Streets, New York City.

DREDGING in Black Rock Harbor, Conn. Until October 11. Address Col. D. C. Houston, U. S. Engineers, Army Building, Houston and Greene Streets, New York City.

INCREASING HEIGHT OF EAST JETTY at Saybrook, Conn. Until October 13. Address Col. D. C. Houston, U. S. Engineers, Army Building, New York City.

CONSTRUCTING A DIKE on the Thames River, Conn. Until October 13. Address Col. D. C. Houston, U. S. Engineers, Army Building, New York City.

DREDGING in Flushing Bay, N. Y. Until October 11. Address Col. D. C. Houston, U. S. Engineers, Army Building, New York City.

EXTENDING DIKE in New Haven Harbor, Conn. Until October 13. Address Col. D. C. Houston, U. S. Engineers, Army Building, New York City.

INCREASING HEIGHT OF DIKE in the Connecticut River at Hartford, Conn. Until October 13. Address Col. D. C. Houston, U. S. Engineers, Army Building, New York City.

EXTENDING THE BREAKWATER at Greenport, N. Y. Until October 13. Address Col. D. C. Houston, U. S. Engineers, Army Building, New York City.

Building Intelligence.

We solicit from each and every one of our readers information relating to projected buildings in their locality, and should be glad to receive newspaper clippings and other items of interest.

ABBREVIATIONS.—*br*, brown stone; *br*, brick; *br st*, brick store; *bs dw*, brown-stone dwelling; *apart*, house, apartment-house; *ten*, tenement; *e*, each; *o*, owner; *a*, architect; *b*, builder; *fr*, frame.

NEW YORK CITY.

Park pl, n e cor Greenwich st, 5-story br store; cost, \$15,000; o, S. C. Welch, executor, 111 E 57th st; a, J. E. Ware; b, J. P. Niblo.

South st, on piers 2 and 3, East River, one and 2-story fr ferry-house, covered with iron; o, New York and South Brooklyn Ferry and Steam Transportation Co., John W. Ambrose, President, 575 Lexington av; a, August Namur.

84-86 James st, 2 5-story br tens with stores; cost, each, \$18,000; o, Matthew Coogan, 422 E 115th st; a, Adam Munch.

18 Norfolk st, 5-story and bmt br ten with stores; cost, \$20,000; o, Louis Gootman, 165 Henry st; a, Fred. Ebeling.

20 Norfolk st, 5-story and bmt br ten with stores; cost, \$20,000; o, Morris Franklin, 248 Bowery; a, Fred. Ebeling.

58th st, n s, 50 e Madison av, three and 4-story br boiler-house; cost, \$20,000; o, New York Steam Co., 22 Cortlandt st; a, Wm. C. Hazlett; b, not selected.

1st av, s e cor 55th st, 4 5-story br tens with stores; total cost, \$70,000; o, Richard Riker, 135 E 46th st; agent, J. H. Riker, same address; a, Thom & Wilson; m, George Whitefield.

59th st, s s, 325 e 9th av, 2 5-story br (s front) tens; cost, each, \$20,000; o and b, Alexander Walker, 517 W 104th st, and David D. Lawson, 420 W 47th st; a, M. V. B. Ferdon.

26th st, n s, 125 e 8th av, 3 5-story br (s front) tens; cost, each, \$20,000; o and b, Jas. B. Gillie, 519 W 104th st; a, M. V. B. Ferdon.

85th st, s s, 194 w Av A, 5-story br ten; cost, \$12,000; o, George Schreiner, 417 East 6th st, and John Schreiner, Jr., 348 E. 82d st; a, John Brandt.

85th st, s s, 213 w Av A, 3 5-story br tens; cost, each, \$12,000; o and a, same as last.

85th st, s s, 288 w Av A, 5-story br ten, with stores; cost, \$18,000; o and a, same as last.

120th st, n s, abt 290 e Pleasant av, 2-story br stable and dwell; o, The Mayor, Aldermen, and Commonalty, per Commissioners of Charities and Correction, 66 3d av; a, N. Le Brun & Son.

70th st, s s, 275 e 2d av, 2 5-story br flats; cost, each, \$21,500; o, Max Danziger, 11 E. 79th st; a, J. C. Burne; built by day's work.

117th st, s s, 175 e 2d av, 5-story br flat; cost, \$14,000; o, New York Condensed Milk Co., 79 Murray st; a, M. V. B. Ferdon; b, James P. Niblo.

81st st, n s, 317 w 9th av, 4 4-story br dwells; cost, \$15,000 to \$20,000 each; o, Louis S. Frankenhimer, Trustee, 312 W. 23d st; a, Rossiter & Wright; b, Thomas Dobbin and John J. Brown.

95th st, n s, 275 w 8th av, 4 3-story br and st front dwells; cost, each, \$10,000; o, Mary C. McKenna, 1115 10th av, a, Charles T. Mott; b, James McKenna.

Manhattan av, w s, 115th to 116th sts, 10 3-story br dwells; cost, each, \$7,000; o, George F. Ferris, 762 Madison av; a, W. B. Tuthill.

122d st, 175 w 7th av, 5 3-story and bmt br (stone front) dwells; cost, each, \$14,000; o, Edward L. Gallon, 213 W. 122d st; a, G. M. Walgrove.

157th st, n s, 100 w St. Nicholas av, 3-story br and fr dwell, cost, \$11,000; o, Samuel Galle, 307 E. 10th st; a, Carl Pfeiffer; m's, Thompson & Mickens; b, not selected.

8th av, e s, 74.11 s 143d st, 5-story br (stone front) ten, with store, cost, \$15,000; o, James W. Ramsey, 225 W. 123d st; a, Geo. M. Walgrove.

8th av, n w cor 144th st, 5-story br ten, with stores; cost, \$18,000; o and b, John Donnellon & Sons, 489 W. 145th st; a, J. H. Valentine.

8th av, w s, 24.11 n 144th st, 3 5-story br tens, with stores; cost, each, \$13,000; o, a, and b, same as last.

7th av, w s, from 122d to 123d st, 8 5-story br (s front) flats with stores; cost, two \$35,000 each, and 6 \$15,000 each; o, Ella M. Griffith; 309 W 55th st; a, A. B. Ogden & Son.

Manhattan av, s e cor 106th st, 5 bldgs, and 106th st, s s, 69.6 e Manhattan av, 3 bldgs; cost, each, abt \$8,000; o, John Brown, 424 Bloomfield st, Hoboken, N. J., and James Lamb, Willow and 13th sts, Hoboken, N. J.; a, C. P. H. Gilbert; b, not selected.

122d st, n s, 80 w 7th av, 5-story br (s front) flat; cost, \$16,000; o and a, same as last.

150th st, n s, 300 w St. Nicholas av, 2-story br stable; cost, \$13,000; o, James A. Bailey, 118 Madison av; a, S. B. Reed; b, Fordyce & Himpler.

180th st, s s, abt 200 e 10th av, 1-story fr temporary dwell for laborers; cost, abt \$5,000; o, Charles H. Chesebrough, North Port, L. I.; agent, Matthew Kyle, High Bridge; a, Donato Cuozzo.

Lincoln av, n w cor 134th st, 5-story br ten with store; cost, \$16,000; o, Anton Schappert, 461 E 135th st; a, Arthur Arcander; b, John Mooney.

BROOKLYN.

Front st, s w cor Bridge st, two 5 and 2 story br factories; cost, total, \$53,000; o, Boorum & Pease, 26 Reade st, New York; a, Parfitt Bros.; b, T. Dobbin and E. S. Boyd & Son.

Hamburg av, n e cor Starr st, 4 3-story br filled stores and tens; cost, corner, \$5,000, others each \$4,500; o, Aug. Sedlmeir, Central av and Myrtle st; a, G. Hillenbrand and W. Bayer.

Hancock st, s s, 40 e Nostrand av, 3 3-story and bmt br dwells; cost, each, \$13,000; o, a, and b, George Phillips, 177 Hancock st.

Sterling pl, n s, 274 e 6th av, 5 2-story b s and br dwells; cost, \$30,000; o and a, John Taaffe, 1136 Herkimer st.

Waverly av, w s, 200 n Park av, 1-story br soap factory; cost, \$6,500; o, C. H. Higgins; a, S. Harbison; b, W. Doris.

Rutledge st, s s 130 e Marcy av, 2 3-story br tens; cost, each, \$6,500; o and m, John Auer, 226 Rutledge st; a, Platte & Acker; c, J. Bossert.

Putnam av, n s, 310 e Throop av, 3 2-story and bmt dwells; cost, each, \$4,800; o, a, and b, Chas. Isbil, 535 Putnam av.

Partition st, n s, 80 w Richard st, 4-story fr ten; cost, \$5,000; o, Henry Rugge, 206 Richard st; a and b, C. M. Detlefsen.

40 Van Brunt st, e s, 40 s Van Dyke st, 2 4-story frame store and tens; total cost, \$10,000; o, H. Schwartz; a and b, C. M. Detlefsen.

4th Pl, n s, 125 e Henry st, 2 4-story br tens; cost, each, \$6,000; o and a, Mary E. Lynch, 825 Union st; b, J. McClean.

Baltic st, n s, 372 w 4th av, 2 4-story br tens; cost, each, \$5,000; o, a, and b, Jos. F. Brush, 598 Atlantic av.

Aberdeen st, s s, 90 w Bushwick av, 4 2-story fr (brick filled) dwells; cost, each, \$2,700; o, A. M. Sagar, 1248 Bushwick av; a, J. V. Sagar.

Clason av, w s, 125 s Flushing av, 4-story frame (br filled) ten; cost, \$6,000; o, P. F. Lenhart, Greene av, a, W. A. Bennett; b, T. D. Eady and W. Maschke.

Vigeliust st, s s, 84 e Broadway, 22 2-story frame (br filled) dwells; cost, each, \$3,000; o, George Walker, 153A Hull st; a, J. E. Dwyer.

Canton st, s w cor Bolivar st, 3-story br repair shop for fire department; cost, \$18,484; o, City Brooklyn; a, Engineer's Office, Dep't City Works; b, P. McGuinn.

Union av, n s, 50 w Alabama av, 5 2-story fr dwells; cost, each, \$2,000; o and a, John P. Free, Fulton Pl, cor Eldert st; b, T. Bennett and H. M. Smith.

5th av, e s, 20 s Sterling Pl, 4-story br store and apart. house; cost, \$9,000; o, F. J. Cole, 153 Flatbush av; a, W. M. Coots; b, D. H. Williamson.

5th av, e s, 40 s Sterling Pl, 4-story br steam laundry; cost, \$6,000; o, a, etc., same as last.

North 10th st, s e cor Berry st, 4 3-story fr (br filled) stores and tens; cost, each, \$4,000; o and b, Stephen J. Burrows, 236 Ainslie st; a, Th. Engelhardt.

3d Pl, s s, 16 e Henry st, 6 2-story and bmt brown stone dwells; cost, each, \$4,000; o, John D. Carscullen, 448 Clinton st; a, G. Damen; m, J. Cody; c, not selected.

2d av, n w cor 39th st, 1-story br and Belleville stone ferry house; also frame shed and frame shed for workshop; cost, about \$25,000; o, New York and South Brooklyn Ferry, etc., Co., 94 Wall st, New York; a, C. C. Haight; b, not selected.

Fulton st, n w cor Rockaway av, 3-story br and brown stone store and flats; cost, \$8,000; o, Geo. R. Brown, 34 South Portland av; b, L. E. Brown and J. F. Rentana.

13-17 Ainslie st, n s, 175 e Marcy av, 3 4-story br tens; cost, each, \$7,000; o, Martin Meyer Bros., Marcy av cor Hope st; a, A. Herbert; b, M. Smith and C. Schneider.

Fulton st, n s, 20.6 w Rockaway av, 7 3-story brown stone stores and dwells; cost, each, \$5,000; o, Geo. R. Brown, 34 South Portland av; b, L. E. Brown and J. F. Rentana.

Fulton st, s s, 225 e Rochester av, 3-story fr (br filled) store and dwell; cost, \$3,800; o, a, and b, D. B. Morehouse, 516 Lexington av.

ALTERATIONS, NEW YORK.

120th st, n s, abt 290 e Pleasant av, dwell altered for receiving hospital, 3-story br enclosure to contain ambulance elevator; cost, \$5,000; o, The Mayor, Aldermen, and Commonalty, per Commissioners of Charities and Correction, 66 3d av; a, N. Le Brun & Son.

416 12th st, through to Bethune st, burned store bldg rebuilt; cost, \$15,000; o, J. T. Johnston, 121 Liberty st; a, Renwick, Aspinwall & Russell; b, Moran & Armstrong and Austin Gibbins.

2d av, e s, 50 n 9th st, present side galleries and wooden arches, new gallery built across front of auditorium, new stairs to gallery and iron ventilators in roof; cost, \$5,000; o, Tabernacle Baptist Church Soc., L. H. Bigelow, Chairman Board of Trustees, 1 Rutherford pl; a, Joseph Ireland.

20 E. 21st st 3-story store raised to four stories and bmt, bay windows on front, new iron stoop, etc.; cost, \$5,000; o, F. P. Forster, 33 Washington sq.; a, Rossiter & Wright; b, not selected.

ALTERATIONS, BROOKLYN.

Bedford av, n e cor S 1st st, 3-story br exten; cost, \$3,200; o, Mrs. E. H. Crawford, on premises; a, A. Herbert; b, Lehie & Moran.

(Continued on page 429.)

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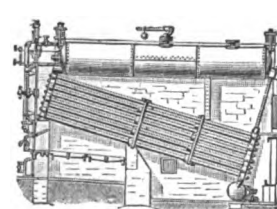
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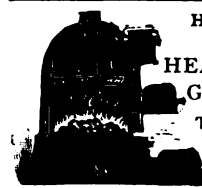
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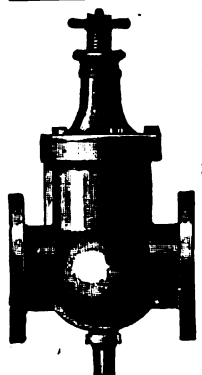
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THE SANITARY ENGINEER.

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In the 1,400 water-works of this country there has been so far but little attention paid to producing purity of the water supplied by any but the crudest methods. Almost every supply is subject to occasional inconvenience, to say the least, by the water becoming unpleasant to taste and smell, either from the growth of algæ or the turbidity caused by heavy rainfalls. In many places, large and small, the supply is not free from defilement by sewage and manufacturing wastes.

With the progress of chemical science it is probable that effectual methods will be devised for operating on waters in large quantities at very slight expense, in such a way as to render it practicable to treat the whole of the supply to a town without either adding enormously to the cost of maintenance of the works or requiring the employment of a high grade of skilled labor. The trouble with the methods which have been applied to supplies on a limited scale for manufacturing purposes where great purity was required has been their complicated character and their cost.

Even simple mechanical purification by filtration has proved so expensive when thoroughly carried out in England that American engineers have been slow to recommend it and American towns slower to adopt it.

The combination of mechanical and chemical methods by Anderson at Antwerp has excited considerable attention, but engineers and public authorities have not yet reached the point of adopting it, although the cost is stated by Mr. Anderson not to exceed sixty cents per million gallons for wages and materials. The supply at Antwerp is about two million gallons a day.

The difficulty resulting from the deterioration of filtered water by exposure to light and air in reservoirs has operated against the adoption of filtering systems. If it should be proven beyond cavil that this can be overcome by surcharging the water with air under pressure after filtration and before delivery into the reservoir, as has been claimed by some experimenters, a great step in advance will have been gained, and it is not impossible—indeed, we may say not improbable—that within a very short period we may see a method invented which will insure the purification of water and its delivery to consumers in a pure state at a moderate cost.

A SUCCESSFUL architect recently spoke approvingly of an editorial in our issue dated September 23, in which we criticised the action of the Milwaukee Association of Architects for adopting a sliding scale of prices for their professional work. He stated that his experience had been that, in adhering to the regular scale of charges adopted by the American Institute of Architects, he had simply lost troublesome and unprofitable work, whereas his practice had largely increased in the very kind of work that every architect aspires to secure. We commend this experience to the architects of Milwaukee, who have an idea that the public will think more of their services when they, by official action, depreciate the general estimate of their value. No

matter how low the scale of charges, some men to get work will always cut under it, and any architectural association must recognize that fact. Moreover, in the race with parties whose main claim for business is a low price, honest and capable architects will certainly be "left."

THE report of Colonel George T. Balch to the Commissioners of Accounts on the "Repavement of Fifth Avenue," in this city, has been published. He was required to report whether the pavement was laid in accordance with the terms of the contract made between the city and the contractor, Matthew Baird. While the work may have been as well done as the average paving-work executed in this city under former administrations, it was perfectly evident to any engineer who has examined it that it was anything but a first-class job, and Colonel Balch should have had no difficulty in pointing out wherein the work failed to conform to the terms of the contract. A portion of the report is an interesting contribution to the literature on "street-pavements," but a hasty perusal of it is only necessary to indicate that it contains a great deal of matter not usually found in the report of an engineer on the condition of a piece of work. It is to be regretted that the weight and force that should attach to a report of this character should be diminished by the presence of so much needless padding and special pleading. Aside from a statement of facts, the report is open to the criticism of being too much like the brief of an attorney employed to secure the conviction of a defendant rather than the testimony of a witness who is supposed to give an impartial account of what his examination revealed. Such portions of the report as seem to us of interest to municipal engineers generally we shall refer to at another time.

ONE of the results of the plumbers' strike in Kansas City was the inducing of the Superintendent of Buildings to make an examination of the character of the plumbing-work done in that city. His examination produced the following report to the Mayor and secured the reference by the City Council of the matter to a committee, with instructions to prepare an ordinance to meet the difficulty:

"At the solicitation of a number of journeymen plumbers I have this day made a personal examination of a number of houses to inform myself concerning the manner in which plumbing has been done and is now being done in this city. I found very few if any houses in which the plumbing is being done properly. Our laws, as they now exist, are very lax, but even in their laxity they require that very much better work should be done in a mechanical as well as a sanitary point of view. In several instances I found the only escape for sewer-gas was through the sink, bath-tub, or water-closet. It does seem to me that innocent persons who are to occupy those houses should be protected. In my opinion the only way to remedy this evil would be the immediate appointment of a competent inspector of plumbing, whose duty it should be to make a personal inspection of every house in which plumbing is being done. Yours very truly,

"W. B. EVERHART,
Superintendent of Buildings."

Kansas City has a plumbing law, but inadequate provision for its enforcement. If that

deficiency is supplied the trouble there will not have been altogether without good results to the community.

OUR BRITISH CORRESPONDENCE.

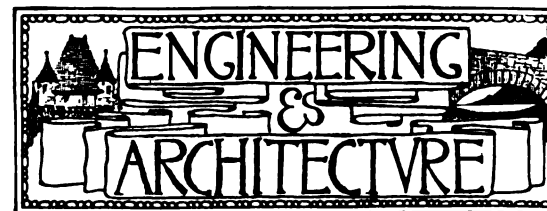
The Newcastle Mining, Engineering, and Industrial Exhibition—Bad Plumbing and Drainage at Cheswick—Electrical Motors for Threshing-Machines—A new Traction-Engine—The Volta Electric-Launch.

LONDON, September 18, 1886.

THE authorities of Newcastle-on-Tyne have issued the particulars of their Mining, Engineering, and Industrial Exhibition (International and Colonial) to be held from 24th of May next until some date as yet unfixed in the autumn. Being the Royal Jubilee Year, it is probable this will not be the only exhibition held in a leading provincial town, but the Newcastle authorities are enterprising and generally to the fore.

An interesting working model of a six horse-power traction-engine, or a road-locomotive, is on view at the Liverpool Exhibition. The model is by Mr. Stephen H. Terry, of Surbiton, Surrey, weighs seventy pounds, and on a level-boarded floor will draw a load of three-hundredweight. The working pressure of the engine is fifty pounds, its cylinders are 1-inch diameter, and the stroke $1\frac{1}{4}$ -inch. It is geared at 9 to 1. A special feature of the engine is a spring attachment to the wheel, rendering it an elastic medium, and, owing to the fact that it does not "jump" on a road as an ordinary wheel will do—increasing the tractive force. This attachment consists in helical springs, laying along the inside circumference of the wheel, connected between the outer end of each spoke, and through the medium of a bracket, at the point of insertion of the next adjoining, with the tire out the wheel.

Following up their experiments on the Thames with the electric-launch "Volta," Messrs. Stephens & Co., of Mill-wall, a few days since made a trip between England and France. The object of the patentees is to emphasize the



OUR SPECIAL ILLUSTRATION.

THE UNION THEOLOGICAL SEMINARY BUILDINGS IN NEW YORK CITY.—WILLIAM A. POTTER AND JAMES B. LORD, ARCHITECTS.

THE group shown in our illustration comprises four buildings, and is situated on the west side of Park, or Fourth Avenue, between Sixty-ninth and Seventieth Streets. The central building on the avenue front is the chapel, the building on the north is the lecture-hall, the building on the south is the library, and that on the rear (west side of the lot), running through from Sixty-ninth to Seventieth



A COUNTRY RESIDENCE AT HIGHLAND MILLS, N. Y.—JAMES D. HUNTER, ARCHITECT.

Mr. Ramsay, surveyor to the Cheswick local board, calls attention to the fact that in the portion of a district known as Cheswick proper, where the death-rate has been 25 per 1,000, 75 per cent. of the sinks were found directly connected with the sewer. In Bedford Park District, where the death-rate stands at only 7 per 1,000, all sinks are disconnected, and only one soil-pipe was found unventilated. These figures are cited to show the importance of enforcing local by-laws, which enforcement is lax in too many communities.

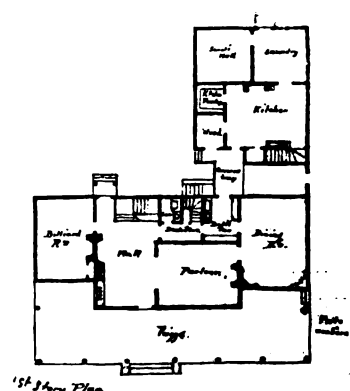
The use of electricity as a power for agricultural machinery has been reported. It is said that on the estate of the Marquis of Salisbury, at Hatfield, a Gramme machine was attached to a corn-threshing machine, the generator being driven by water-power half a mile distant. To meet any necessity of stoppage of the machine an arrangement is made whereby the current from the generator can be returned from the Gramme machine into a cluster of Swan lamps, the object being to avoid the necessity of stopping the whole machine and at the same time to give warning to the men that the current is running.

utility of electricity for driving torpedo-boats, launches, etc. They claim that, by storing electricity in accumulators, which will only require occasional charging when not in use, boats can be held always ready for use. The average speed in the journey to France was about five miles, but, on the return, for half an hour the boat was driven at fourteen miles an hour. She is thirty-seven feet in length, nearly seven feet beam, built of steel plates, and so constructed that the whole space beneath the deck floor can be filled with accumulators. Upwards of sixty were actually carried. As a proof of the noiseless way in which the boat travels it is stated that the pilot, observing a sea-gull asleep on the water, ran the boat alongside, and the bird was actually in the hands of one of the passengers before awakening, and was brought into port alive.

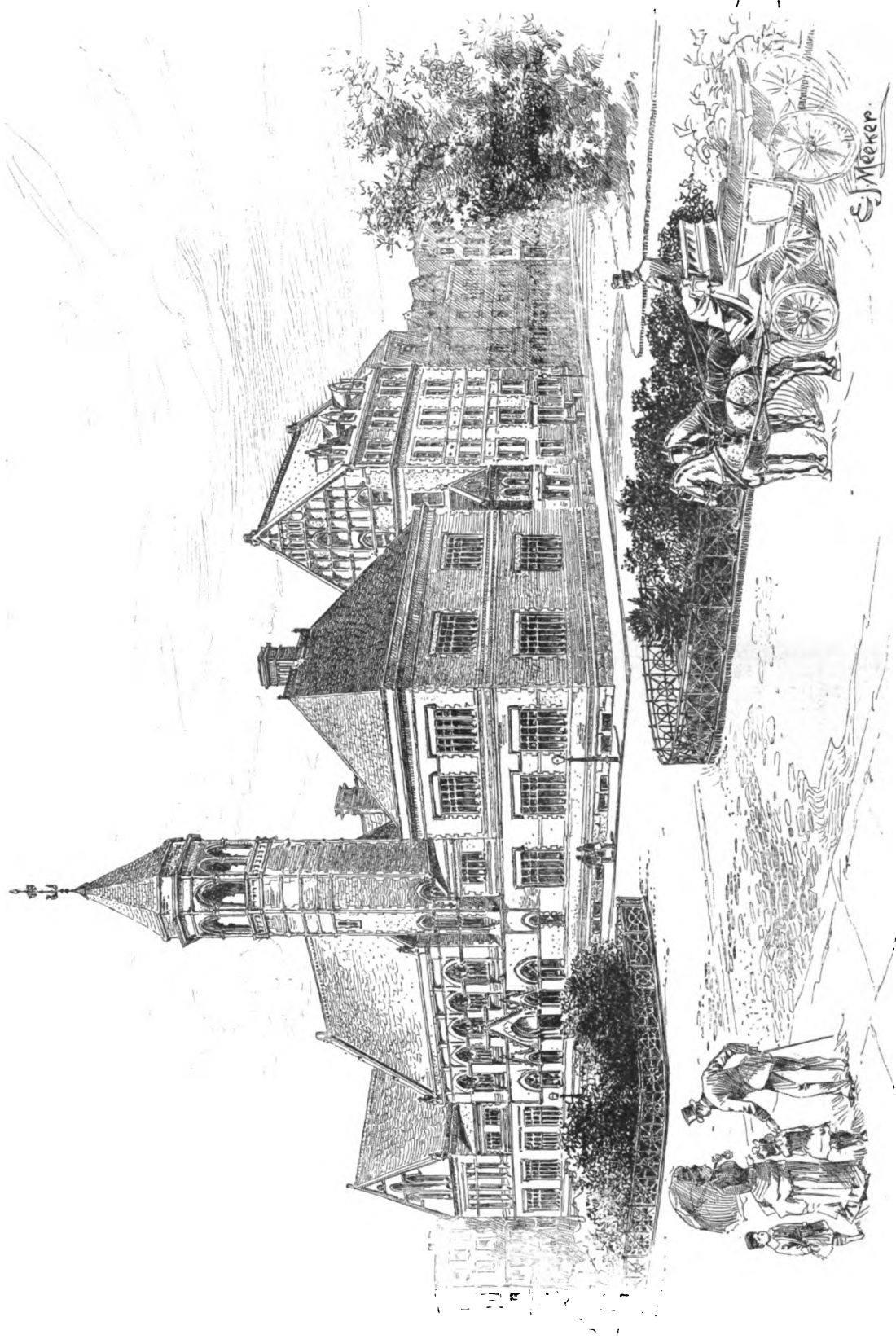
SAFETY-VALVE.

THE *Century* for October contains a paper on the "American Explorations in Assos," by Mr. F. H. Bacon, of Boston, one of the leaders of the expedition. It is beautifully illustrated after sketches by Mr. Bacon and photographs. Prof. W. R. Ware furnishes an introductory note.

Street, is the dormitory. The chapel has rooms for offices on the first floor, and a covered arcade connects all the buildings with the dormitory. The exterior is of Colabaugh brick, with Long Meadow brownstone trimmings. The interior finish of the main buildings is of oak, of the dormi-



PLAN OF COUNTRY RESIDENCE AT HIGHLAND MILLS.



THE SANTARY ENGINEER ILLUSTRATED SERIES.

THE UNION THEOLOGICAL SEMINARY, NEW YORK CITY.

WILLIAM A. POTTER AND JAMES B. LORD, ARCHITECTS.

tory building of ash. The cost was about \$350,000. The architects were Messrs. William A. Potter and James B. Lord, of New York City.

OUR ILLUSTRATIONS OF MODERATE-COST HOUSES.

A COUNTRY RESIDENCE.—JAMES D. HUNTER, ARCHITECT.

THE subject of one of our vignettes this issue is the country residence of the Hon. Thomas C. Platt, at Highland Mills, N. Y. The first story is clapboarded; the second story is shingled and stained a reddish-brown; clapboards are painted to match. The first-story hall is wainscoted to the ceiling, the ceiling beams showing, and ceiled between beams; all of American oak. The dining-room is finished in cherry. The architect was James D. Hunter, Jr., New York.

A BLOCK OF PRIVATE RESIDENCES IN CHICAGO.—W. L. B. JENNEY, ARCHITECT.

THE subject of the vignette illustration on this page is the block of houses located opposite Lincoln Park, in

of the *Inter-Ocean*, and are of rock-faced buff Bedford limestone. The two front doors open off on a porch common to both houses. The bay windows and dormers are of copper, with red slate trimmings. The interior of the houses is handsomely finished, for the most part in hard woods. The estimated cost of the two houses is \$20,000. The floor plans are given on page 442. The architect was Mr. W. L. B. Jenney, of Chicago.

THE TUNNEL UNDER THE RIVER MERSEY AT LIVERPOOL.

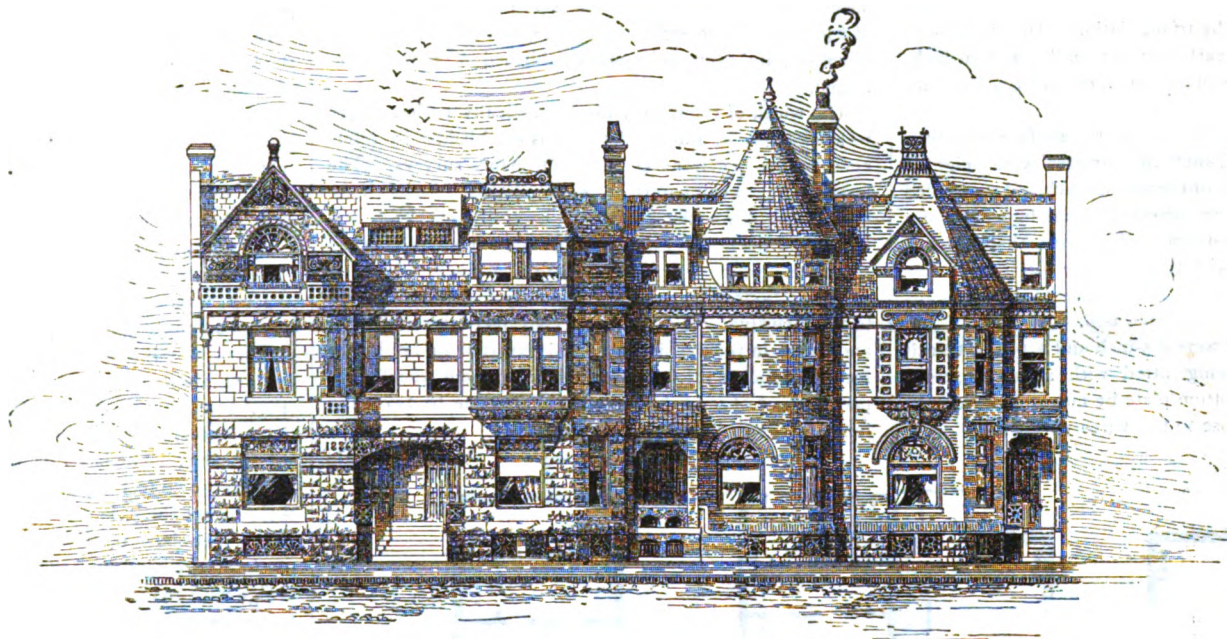
No. I.

WE propose in this and subsequent articles to give full illustrations and description of this important work, together with the accessories for ventilation and lifting the passengers at the termini; the information being condensed from two papers in the Proceedings of the Institution of Engineers, Vol. LXXXVI., Part IV.*

The Mersey Railway was incorporated in 1866, with the object of joining the railway systems on the two sides of

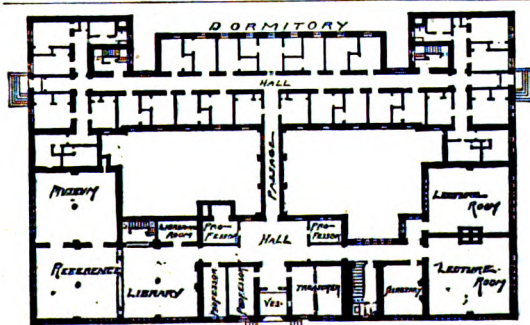
was full of fissures which would let the River Mersey in upon the works. As a matter of fact, but one fissure about ten inches in width had been encountered. This was filled with disintegrated sandstone and clay, and although it required careful timbering, it was certainly dryer than other parts of the work. This fulfilled the prophecy of Sir James Fowler, and also had been the opinion of Sir D. Fox.

Mr. T. Mellard Reade had previously expressed his opinion that a buried rock-channel of a pre-glacial river filled with boulder clay would be encountered (as indicated by many well sinkings at points higher up the river); and as showing the bearing of scientific geology upon engineering work, borings taken in the river proved the prediction to be true, the ancient river bed being found near the Liverpool shore. As a result the main tunnel was lowered ten feet, and at the point indicated by the borings the tunnel was excavated in well-timbered lengths of nine feet each, and the brick-work thickened to three feet at the crown. The tunnel here has a total cover of 70 feet, and for a length of 200 feet passes from 3 to 6 feet above



A BLOCK OF PRIVATE RESIDENCES IN CHICAGO.—W. L. B. JENNEY, ARCHITECT.

Chicago, on the angular piece of ground formed by the intersection of La Salle Avenue with North Clark Street. The two north houses, built in the fall of 1885 for Major Samuel Barrett, have cost about \$18,000. The fronts are of pressed brick, with terra-cotta bay and trimmings. The interiors throughout are of hard-wood trimmings and floors. The two south houses were built for the proprietors



FIRST STORY PLAN
UNION THEOLOGICAL SEMINARY.

the River Mersey, and giving rail communication between the city of Liverpool and the town of Birkenhead.

The authorized length is $5\frac{1}{4}$ miles of double line; the portion shown in section in Fig. 1 is about three miles (divided into eighths by the figures on the datum line).

Work was begun in December, 1879, by Major Isaac, to test by an experimental heading the feasibility of the work. Borings had shown that the new red sandstone rock extended generally across the river, but a heading was thought to be necessary to prove its continuity and freedom from fissures, and there was great incredulity as to the practicability of the scheme. By May, 1871, this work had advanced sufficiently to justify the commencement of the permanent works.

A contract was then made, and in August, 1871, active work began and was prosecuted day and night until the opening on the 20th of January last.

When the work was first proposed all sorts of difficulties were suggested, the chief one being that the sandstone

the sandstone rock through a thin layer of red clay and sand; the rock was at least 15 feet thick over the tunnel at all other points. The minimum amount of cover is 30 feet, and the depth of water at the same point at high tide is 100 feet.

The beds in the rock dip to the east at an inclination of 1 in 14, and much more water was encountered on the Liverpool side than at Birkenhead. Another interesting fact was discovered, that more water was met with in the approaches than under the river. The amount was sensibly increased also at high tides. Mr. B. Baker, M. Inst. C. E., in commenting on this, said he thought it might be taken as being practically proved to be true generally in rocky strata, that there was less water under the sea than under the land portions of a work, and the fact had an important bearing upon any future contemplated submarine tunnel.

The quantity actually pumped was between 7,000 and 8,000 gallons per minute, although the pumping-power provided was, at ordinary working speed, about 19,000 gallons.

The works were begun by sinking a shaft on each shore, that in Liverpool being fifteen feet in diameter (Fig. 1),

* "The Mersey Railway," by Francis Fox, M. Inst. C. E.; and "The Hydraulic Passenger-Lifts at the Underground Stations of the Mersey Railway," by William Edmund Rich, M. Inst. C. E.

and about 170 feet deep to bottom of sump, and the one in Birkenhead seventeen feet six inches in diameter, and of similar depth. The distance between the quay walls is 3,960 feet, and between the pumping-shafts 5,310 feet. The lining of these will be illustrated in our next article.

Near the bottom of the shafts "standage headings" were driven, each having a capacity of 80,000 gallons, to secure time for the miners to escape in case of a sudden influx of water. These are sufficient to prevent the water now seeping into the tunnel from rising so high as the rails in less than five hours, thus giving time for any ordinary repairs, even if all six sets of pumps should stop at the same time.

From each shaft the drainage heading was driven toward the centre of the river with rising gradients of 1 in 500 and 1 in 900. The work was at first by hand, thirty to thirty-nine feet per week of 9x8 feet heading being driven. Afterward a Beaumont boring-machine, which cuts a circular hole seven feet four inches in diameter, was used. This gave an average weekly progress of 43½ feet, including the time lost in setting the machine, and a maximum week's work of 102 feet. In softer rock a speed of 195 feet was obtained. This circular opening had afterward to be enlarged. Only portions of the work had to be lined, and for this purpose "plank tubing" was used.

The "setting out" of the heading was a work of some difficulty, since the pumping-shafts were not on the direct line. This was done jointly by Mr. Irvine, the resident engineer, and Mr. Davidson, the contractor's engineer.

To make the survey the centre line had to be transferred to points on the roofs of high warehouses, and the positions of the shafts fixed by triangulation. In Liverpool a cross cut of thirty feet nearly at right angles and in Birkenhead a cut at an angle of 130 degrees and 103 feet long were made.

The lines were first set out on the surface and then German silver wires ¼-inch in diameter were weighted with plumb-bobs of thirty-three pounds each and suspended in the shafts. These were corrected to line by means of a fine-threaded screw adjustment. To be sure that the wires hung free from contact with the pumps or machinery, they were tested electrically by interposing a galvanometer between the battery and the plumb-bob.

The instruments used were a 5-inch and a 6-inch transit theodolite, the latter being fitted with a special screw-adjustment under the bottom plate by means of which the instrument (set up as close to the wires as possible) could

be brought into the line of the wires below to within one-third of their diameter, or ⅛th of an inch.

It was found that with a wire base of ten feet five inches the lines could be transferred down one shaft which was on the centre line of the tunnel with an extreme error below, of no more than ¾ inch in 433 feet, the operation being performed three times, starting always from the surface-line.

The Birkenhead lines, which were prolonged to the junction of the headings, were the mean of eight observations, two of which down the pumping-shaft were worked from a wire base nine feet ten inches long, and six others down the working-shaft from a line nine feet eight inches long.

These were connected afterward by the "staple-shaft" (Fig. 1) at 1,410 feet from the pumping-shaft.

The same was done on the Liverpool side, the staple-shaft being 885 feet from the pumping-shaft. The headings met at 3,345 feet from the Birkenhead shaft with an error of one inch in meeting, but as both lines had diverged slightly southward the maximum error at the centre was 2½ inches. The error was less in those lines taken down the working-shafts ninety-five feet deep than those down the pumping-shafts with bobs suspended at 163 feet depth.

Landwards the lines were checked at distances of 1,470 and 1,200 feet through temporary air-shafts, maximum errors after passing respectively 28 and 35 degrees of curvature being 2½ and 1¾ inches. Throughout, the instrument was never assumed to be correct, but inverse observations were made and the mean point determined. Points were marked at intervals of 240 feet, longer sights being impracticable on account of smoke, and every point was established in the way mentioned.

The width of the river made it practically useless to try to level across it, and the datum was established by reference to the bench marks of the Ordnance surveys. The leveling was a comparatively easy process. Levels were transferred down the shafts by carefully checked steel tapes, and the points established on the two sides, checked when the headings met within ⅛th of an inch.

The sections of the tunnel are plainly shown in Figs. 2 to 13, inclusive. It is of twenty-six feet internal width, and where in rock it is lined and inverted in brick two feet three inches thick, laid in Portland cement, usually one part to three of sand, but in some places one to two; the inner two rings being with headers.

The total number of brick used in the tunnel and covered way was 38,000,000.

It is nineteen feet high from the rails to the intrados, and at intervals of 135 feet, recesses are made for workmen engaged in repairs.

After the heading was completed, several "break-ups" were made to the grade of the tunnel, so that work was at one time being carried on from 24 faces. Additional shafts were sunk for hoisting purposes, to which the rock was brought by inclined planes worked by steam-engines. The whole of the 320,000 cubic yards of rock from the tunnel, and about sixty per cent. of that from the drainage tunnel, were excavated by hand labor; as no large shots, such as are made use of when drilling machines are employed, could have been safely adopted, on account of annoyance to the neighborhood and danger from water. Dynamite was tried and given up on account of the fumes. Gelatine was used to a limited extent, and proved very efficient, giving six feet per week more progress in headings than any other explosive. The explosive which was mostly depended upon was cotton powder, or so-called "tonite," of which 120 tons were used. It proved both safe and reliable, and most efficient in doing its work under exceptional conditions.

It was originally intended that the drainage heading should be below the main tunnel under the centre of the river, but owing to the grade of the latter being depressed, as previously mentioned, this part of the former was absorbed in the main tunnel, and loop headings were driven outside the main line (Fig. 10) to connect the end portions of the drainage heading.

In the finished tunnel the seepage water is carried along the invert in a brick culvert (Figs. 4, 5, etc.) of one foot nine inches radius until it finds its way into the drainage heading.

So effective are the permanent drainage arrangements, that on the occasion of the visit of the Prince of Wales not a drop of water was to be seen, and the only complaint was that "it was slightly dusty."

Figures 4, 5, 6, 7, and 12 show special types of construction, the latter especially being in soft ground, and at a point where other railroad lines cross overhead and require support. At this point the work was done in open cut in a closely timbered excavation. Figures 2, 3, 11, and 14 show sections at stations. At James Street (Fig. 11) the rails are ninety feet below the level of the ticket-offices, and at Hamilton Square (Fig. 14) 100 feet below same. The latter is 400 feet long, fifty feet wide, and thirty-two feet high, arched with brick-work two feet three inches thick, laid in cement, and lined to a height of twelve feet above platform-level with glazed bricks. The platforms are connected by groined passages and a foot-bridge with an underground hall; from this hall open out a foot-subway ten feet in width leading by an incline or ramp of about one in nine to the surface, a staircase of more than 160 steps, and three passenger-lifts, each giving a floor area of 340 square feet in the cage, and having a stroke in Birkenhead of eighty-seven feet nine inches, and in Liverpool of seventy-six feet six inches. These lifts and the staircase lead to the upper ticket-office, on a level with the public street, which is connected with the usual waiting rooms, etc.

The architectural designs of the station buildings were prepared by Mr. G. E. Grayson, of Liverpool, and include hydraulic towers (Fig. 14), in which are placed the water-tanks for working the hydraulic machinery.

(TO BE CONTINUED.)

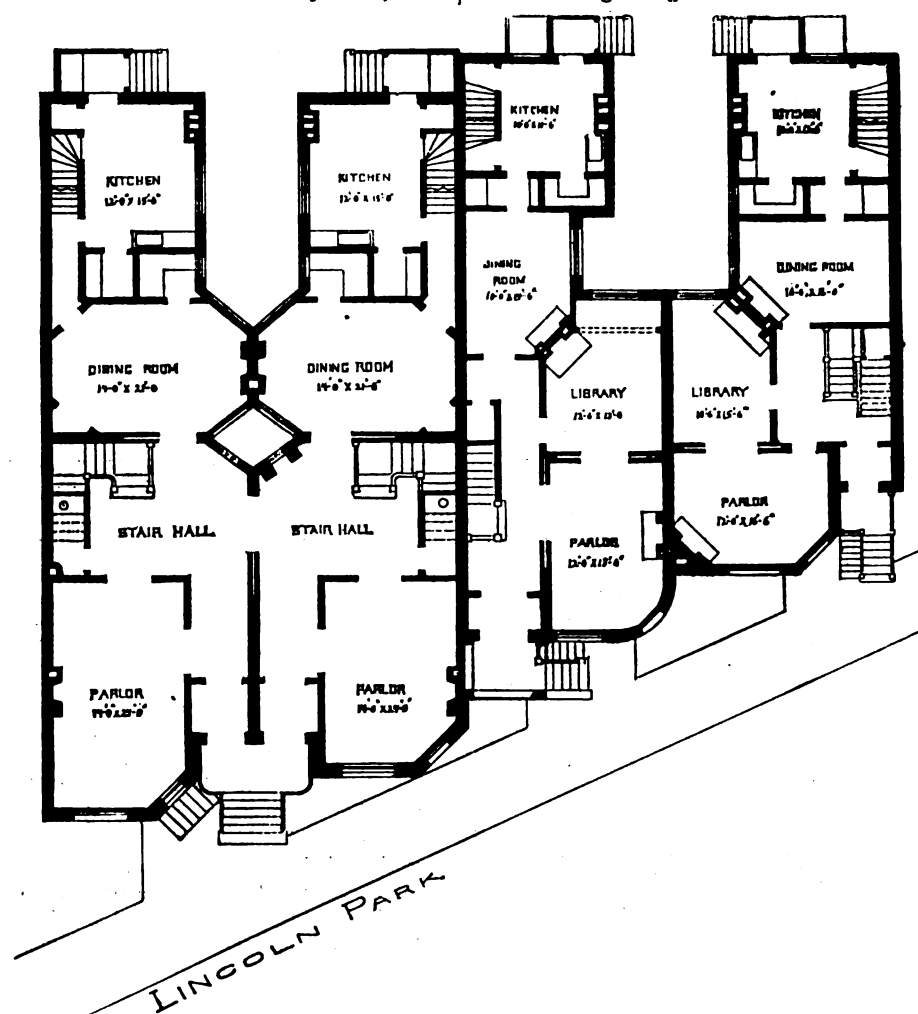
WATER PURIFICATION.

No. II.

In the last number of THE SANITARY ENGINEER we discussed briefly the present state of knowledge with regard to micro-organisms in water, which are now presumed to be in most cases the most important of its impurities.

We now come to the question, How are these micro-organisms to be got rid of, when they are found to exist in dangerous or disagreeable quantity in drinking-water?

In attempting to answer this question, we will take as our text the paper by Dr. Frankland, on "Water Purification," contained in the proceedings of the Institution of Civil Engineers, Vol. LXXXV., Part III., to which allusion was made in our preceding article. Dr. Frankland divides his inquiry into four heads—viz., purification by filtration, purification by agitation with solid particles, purification by precipitation, and purification by natural agencies. As regards filters, his conclusions are much more favorable to



FLOOR PLANS OF PRIVATE RESIDENCES IN CHICAGO. (SEE PAGE 441.)

understand that those bacteria which are anaerobic—that is, which flourish only in the absence of oxygen—would be destroyed by thorough exposure to air, and there is urgent need for a series of experiments which shall show the effect of various processes of filtration, agitation, etc., not upon micro-organisms generally, but upon the different known species of such organisms, and especially upon the pathogenetic forms. It is well known that some bacteria tend to exclude or to destroy other forms, and it is quite probable that such experiments as we have referred to will indicate methods which will destroy dangerous organisms, although they may have little effect on the harmless forms.

The results already observed in the action of the nitrifying ferment described by Warrington, taken in connection with the results obtained from sewage irrigation or soil filtration on a large scale, clearly point to this conclusion.

Dr. Frankland points out that it is more difficult to remove from water some kinds of organisms than others, and that those bacteria which cause liquefaction of gelatine—among which are some of the most dangerous forms—are more readily destroyed than those which do not effect such liquefaction.

With regard to precipitation methods, Dr. Frankland's conclusion seems to be fully justified by his experiments—viz., that chemical precipitation is attended with a large reduction in the number of micro-organisms present in the water in which the precipitate is made to form and allowed to subside, but that if subsidence, either with agitation or after precipitation, be continued too long, the organisms first carried down may again be redistributed through the water.

Finally, it should be observed that processes for the purification of general water-supplies are desirable, not only for the removal of dangerous micro-organisms, but also for the removal of matters which are offensive to the senses, to clarify water from suspended particles of clay, etc., which make it unfit for bathing, to remove algae, and to oxidize and destroy certain matters which cause offensive odors. For all these purposes simple sand filters are useful, and if these are constructed of ferruginous sand and combined with means for agitation and thorough aeration at certain times, the results will probably be satisfactory. Meantime we hope that it will not be long before we shall have more exact and definite information than we now possess with regard to the life history of bacteria, which will lead to precision and economy in the devising of methods for their removal.

THE SEWAGE-FARM AT SALTLEY, ENGLAND.*

In our Fourth Volume, issues of August, 1881, we published an account of the sewage-farm of the city of Birmingham at Saltley. We now supplement this description by a paper recently read by Mr. W. S. Till, engineer to the Birmingham Tame and Rea District Drainage Board.

In giving an account of the formation and work of the Birmingham Tame and Rea District Drainage Board, the works of sewage-purification previously undertaken by the corporation of Birmingham form so important a part that any general description of the Drainage Board would be incomplete without some reference thereto; but inasmuch as the efforts of the Birmingham corporation to deal with the sewage difficulty have been so prominently before the various bodies interested in sanitary work, both from the proceedings in Parliament and from several published statements, it has not been thought necessary to make further allusion thereto than may be required for giving a complete history of the position and work of the board.

The Borough of Birmingham, together with the towns of Walsall, West Bromwich, Wednesbury, Darlaston, Tipton, part of Wolverhampton, and a number of other urban or rural sanitary districts, forming the major part of what is known as the "Black Country," is situated near the summit of one of the great water-sheds of England, that of the Trent, being drained by the River Tame, which, with its various feeders, forms a small stream discharging into the Trent, about midway between Tamworth and Burton. Whatever may have been the benefits derived by the large population of the Black Country from being situated high up in the water-shed, one great disadvantage, that of sewage-pollution, soon became apparent, owing to the naturally diminutive character of the water-courses and the

large amount of liquid refuse poured into them. The corporation of Birmingham, as the principal local authority, was early made aware of the responsibility thus incurred, and was earnestly combating the sewage difficulty at a time when the authorities of many towns considered it, if not exactly the right thing to do, at any rate only a venial offence, to discharge their sewage into the rivers or streams that flowed in their vicinity.

At the time the formation of the Drainage Board was suggested, none of the authorities of the towns or districts draining into the Tame had made, so far as the author is aware, any really systematic attempt at sewage-purification, except those of Birmingham and Wolverhampton.

The corporation of Birmingham constructed, as far back as 1853, main intercepting sewers whereby the sewage from those portions of the borough draining to the River Rea and Hockley Brook was conveyed to the general outlet at Saltley, where subsequently a system of tank purification had been adopted, and which was developed from time to time until, at the period when the Drainage Board was formed, the corporation possessed land and works thoroughly capable of purifying, so far as precipitation by lime could purify, the sewage of the borough. The Manor of Aston local board had caused plans to be prepared in 1874, for the intercepting sewers for diverting the sewage of its district from the River Tame and the Hockley Brook, and by agreement the Handsworth local board, whose district is situated on the same water-sheds, but higher up, became joint owners of such sewers. These sewers were constructed in 1876, and although the sewage was thus diverted in detail, it was only to cast it into the Tame again in one united volume pending the decision of these boards as to the method of sewage treatment to be adopted, a problem that threatened to be very difficult of solution had not the Drainage Board about that time been formed, and so relieved those authorities of further trouble. The authorities of the district of Balsall Heath, a small, but somewhat thickly inhabited area draining to the Rivers Rea and Cole, immediately above the Borough of Birmingham, had established some precipitating works of an elementary character at the outlet in the River Cole area, but owing to the great increase of population all around, the use of these works had become objectionable, and as the only outlets for this district lay through the borough of Birmingham, it became necessary, if great expense were to be avoided, that some arrangement should be made for the corporation to provide the requisite outlets. The district of Harborne, likewise situated in the watershed of the Rea, above the borough of Birmingham, had also established a system of tank purification, but open to similar objections to those above named in Balsall Heath, this district also suffering from precisely the same difficulties as to outlet. These, then, were the only districts in the neighborhood of Birmingham, of which the authorities had made any efforts to deal with their sewage; whilst on the other hand there were several districts urgently in need of sanitary reform that had been unable, owing to their positions in relation to other districts, to take independently the necessary step, except at a prohibitive cost.

Birmingham and its sewage-farm, holding, by virtue of its position, the key of the situation, and the corporation anticipating that great expense and inconvenience must ultimately arise if some united action were not taken, it was decided to apply to the Local Government Board, under the Public Health Act, 1875, for an order to form the following urban and rural sanitary districts, or portions of them, into a united district for the purpose of sewage disposal—viz.: the borough of Birmingham, the local Government districts of Aston Manor, Handsworth, Smethwick, Balsall Heath, Harborne, and Saltley; the contributory places of Aston, King's Norton and Northfield, and Perry Barr; and portions of the districts of the West Bromwich Improvement Commissioners, and of the Solihull Rural Sanitary Authority; the principle of selection adopted being to choose only those districts lying round Birmingham, which were restricted in their outlets, or which had no reasonable facilities for establishing purification works of their own.

An inquiry, lasting several days, was held by J. T. Harrison, Esq., the Government Inspector, at the public offices, Birmingham, in which the West Bromwich Commissioners proved to the inspector's satisfaction that they were in a position to establish their own purification works; and the Rural Sanitary Authority of Solihull, having also recently prepared a scheme, was likewise omitted by the inspector.

All the other districts were formed into a united district under the title of the Birmingham Tame and Rea Main Sewerage District, the provisional order coming into operation on September 29, 1877.

The joint board consisted at first of twenty elective members, chosen from the members of the various constituent authorities, of which the borough of Birmingham sent eleven, and the others one each, and two *ex-officio* members—viz., the Mayor of Birmingham and the chairman of the Aston Manor local board. The district was enlarged in 1881 by the addition of the parish of Sutton Coldfield, but no alteration was made in the constitution of the board until Sutton Coldfield was incorporated early in the present year, when the number of members was increased to twenty-four, Sutton Coldfield sending one member and the representation of the borough being increased to the same extent.

The first meeting of the board was held December 6, 1877, when Mr. Alderman Avery, a gentleman well known in connection with the sanitary work of the borough of Birmingham, was elected chairman, a position he still occupies.

The duties of the board are the acquiring of such lands, and the construction and maintenance of such outfall-works as may be necessary for the purification of the sewage of the various constituent authorities, so that it may be discharged into any streams or water-courses without breach of the Rivers Pollution Act, 1876. It is incumbent on each of the constituent authorities either to construct such intercepting-sewers as may be required for conveying the sewage of its district to the outfall-works, or otherwise to arrange terms with one or other of the constituent authorities for the use of such sewers as may be necessary for that purpose. The joint board exercises supervision over the size, character, and direction of new intercepting-sewers, so that they may be laid down with general reference to the requirements of the united district at large, and in the case of its being desirable that one constituent authority should use the existing intercepting-sewers of another constituent authority, it devolves on the joint board to say whether such sewer can and ought to be so used to the extent of, but not exceeding, forty gallons per head per day of the population of the district.

The costs of the joint board are divided into the costs of management and the costs of outfall-works (outfall-works being the land, tanks, and works for purifying the sewage).

All the constituent authorities, with the exception of Perry Barr, are liable to the costs of management, but no constituent authority is liable to the expenses of outfall-works until some portion of such authority's district has been placed in connection with any of the said outfall-works.

The various districts contribute to the expenses of the board in proportion to the number of rated tenements in each district or contributory place, such number being ascertained from the poor rate made last before the times for issuing the board's precepts.

The total area of the drainage district is 47,275 acres, the population in 1885 was estimated at 619,693, and the ratable value £2,401,093.

Appendix A* gives a detailed statement of the area, population, and ratable value.

In accordance with the provisional order, the Drainage Board purchased, as going concerns, all existing lands and works for treatment of sewage owned by the various constituent authorities, such being Birmingham, Aston Manor, Harborne, and Balsall Heath. Of these, the works at Harborne and Balsall Heath had been abandoned as soon as arrangements for outlets were being carried into effect, and the sites of such works were ultimately sold. From the borough of Birmingham the board acquired about 159 acres of freehold, and 103½ acres of leasehold land, together with the extensive system of tanks, machinery, plant, farm implements, and stock, situated at the general outlet at Saltley, and from Aston Manor about six acres of land, also situated at Saltley and surrounded by the corporation farm.

As the outlet at Saltley is the natural point of discharge for fully nine-tenths of the total population of the drainage district, one of the first cares of the Drainage Board after its formation was to assist the various constituent authorities in their endeavors to put themselves in communication with the outfall-works purchased from the Birmingham Corporation. Accordingly arrangements were speedily made for the corporation to receive into their main sewers the sewage from the districts of Harborne and Balsall

* A paper read before the British Association for the Advancement of Science, Section G, in September, 1886, by W. S. Till, C. E., Engineer to the Birmingham Tame and Rea District Drainage Board.

Heath on payment of an annual sum for user; the Manor of Aston local board entered into a contract for the construction of the sewer for conveying its sewage from the temporary outlet into the River Tame to the board's tanks, the Aston Rural Sanitary Authority becoming joint owner with Aston Manor and Handsworth, and thereby procuring an outlet for the Erdington and Witton portions of its district; the Handsworth local board extended one of the Aston and Handsworth joint-sewers so as to accommodate the northern portion of its district, and has since, in conjunction with Smethwick, extended the other joint-sewer, thereby completing for the present the intercepting-sewers of its own district, and providing for Smethwick an outlet for the larger portion of that district. The Saltley local board constructed the intercepting-sewers, and the Rural Sanitary Authority of King's Norton, after arranging with the corporation of Birmingham for an outlet through their main sewer, constructed the intercepting-sewers for the drainage of portions of its district. For those portions of the drainage district that could not conveniently be brought down to the common outlet at Saltley the corporation of Birmingham constructed a sewer for accommodating the area draining to the Cole comprised in the districts of Birmingham, Balsall Heath, King's Norton, and Aston Rural, this sewer being tunneled across the ridge dividing the water-sheds of the Tame and Cole, and discharging on to the new farm. The Aston Rural Sanitary Authority constructed the sewer for the drainage of Sutton Coldfield, this sewer also discharging on to the new farm.

As the result of the intercepting-works just described, the whole of the populated areas of the drainage district, with one exception, are now placed in communication with the outfall-works. The one exception is the district of Smethwick, which, being situated at the summit of the water-shed, has had to await the development of the intercepting system, but it is believed that arrangements are contemplated whereby this difficulty will be shortly removed.

In the meantime, pending the completion of these intercepting arrangements, the Drainage Board had been proceeding with the very important duty of extending its outfall-works, so as to meet efficiently the additional strain that would in due course be brought upon them. It had been generally understood at the time the board was formed that an extension of the outfall-works would be necessary, and, after due consideration, it was decided that the application of the sewage to land, after partial treatment by lime and in the tanks, would be the most satisfactory method of purification. The board accordingly directed its attention to the acquisition of the required area of land. An opportunity that presented itself in 1880 of obtaining the unexpired term of 102 years of a lease of ninety-six acres of suitable land at Tyburn, about $2\frac{1}{2}$ miles below the existing tanks, was embraced, and shortly after a lease for ninety-nine years of 123 acres of adjoining land was obtained, while 250 acres of freehold from the Right Hon. the Earl of Bradford, 350 acres from the trustees of W. W. Bagot, Esq., and 118 acres from various other owners were acquired by mutual arrangement, and more recently a further plot of $18\frac{1}{2}$ acres has been leased from the Right Hon. Lord Norton for twenty-one years, thus making a total of $955\frac{1}{2}$ acres of additional land, or, including the land already occupied by the board at Saltley, a total area of 1,227 acres available for works of sewage disposal. The rent of the leasehold land is at the rate of £4 per acre, and the average cost of the freehold, including timber, buildings, mill rights, tenants' compensation, law charges, etc., £152 per acre.

The nature of the land is very favorable for the purification of sewage, the natural surface of the ground being as a rule even and unbroken, and the level such as to admit of the irrigation of the whole by gravitation, with the exception of about 100 acres. The subsoil is gravel and sand, varying from six feet to ten feet in thickness. To reduce risk of flooding from the river, the board removed the mills and weir, and straightened the river at Minworth, at the lower end of the farm lands, thereby lowering the water-level of the river several feet, and by the construction of outfall-cuts carried to suitable outlets into the river the subsoil drains are placed beyond the influence of back-water, the result being that no inconvenience is experienced from the proximity of the river, except during unusual floods. For conveying the sewage to the land a conduit eight feet in diameter and about $2\frac{3}{4}$ miles long has been constructed, capable of discharging thirty-eight million gallons per day when running half full, or double that quantity when running full, the fall being two feet per mile.

This conduit commences at the outlet end of the large tanks at Saltley, and terminates at Tyburn, valves being placed at suitable intervals for discharging the sewage on to the land passed through. Below Tyburn the capacity of the conduit has been reduced, a conduit three feet six inches in diameter being sufficient for the remainder of the farm. The sewage is drawn from these conduits into open brick carriers, which again discharge into secondary carriers of earth, and thence into the flooding carriers. The brick carriers are constructed with a slight fall, jumps being provided in the inverts at suitable intervals for drawing down the water. The land is drained to a minimum depth of four feet six inches, but in many cases, owing to the level nature of some of the land, a greater depth has been found necessary at the lower ends of the drains. The subsoil drainage consists of 3-inch and 4-inch agricultural drain-pipes placed from one-half to three-quarters of a chain apart, and discharging into main drains of 9-inch, 12-inch, 15-inch, and 18-inch stoneware socket-pipes, which in turn discharge into the outfall channels. Roads generally twelve feet wide, with passing places at intervals, have been laid out with the view of meeting the requirements of the steam-cultivating operations, as well as for the conveyance of produce. In addition to the farm buildings at Saltley purchased from the corporation, farm buildings in a central position at Tyburn have been erected, together with entrance lodge, manager's house, and six laborers' cottages; also smaller buildings at Minworth, and four laborers' cottages. The various farm houses and buildings originally existing have also been repaired and extended.

The total cost of the land and works to the present has been £403,605, of which the purchase of original land and works is £170,544; new land, £110,800; new works, £113,299; farming stock and implements for new land, £9,052. The details of cost are given in Appendix B.*

(TO BE CONTINUED.)

PLANNING HOUSES FOR HOT CLIMATES, AND HALF-TIMBERED GABLES.

BOSTON, October 4, 1886.

SIR: In your issue of September 30, I note what "Engineer" has to say about planning houses for hot climates. Granting that North America really has a hot climate, it does not appear that such a fact should in the least necessitate any change in the shape or extent of our roofs. "Engineer" does not do America full justice. Nowhere else in the world have practical considerations of home comfort and convenience received the attention they have here, and our homes possess a more individually American style than ever our forefather's works could boast of. It is extremely doubtful if the colonial builders had any deliberate intent in presenting the smallest slope of the roof to the sun. There is no reliable testimony to that effect in this section of the country. But whether or no, there is not the slightest necessity for binding ourselves to-day by any such restrictions. A first-class dwelling-house is now invariably plastered on the under face of the roof-beams. If, in addition, the spaces between the feet of the rafters are filled in solid with mortar, the enclosed air-spaces will act sufficiently as non-conductors of heat to keep the house comfortable even in the hottest weather. There are several other ways in which the same result may be achieved, but this is the least expensive.

A little care and judgment can aid considerably in keeping a house cool. An Arab wraps a sheepskin closely about his head to keep him cool. We can imitate the same principle by having doors and windows tightly closed from (say) 9 A. M. to 4.30 P. M., and then opening everything and letting the house be filled and thoroughly aired with the cooler breezes which generally spring up at night. This plan is always attended with success on the hot plains of the West, even when applied to the flimsy wooden shanties, innocent alike of roof-plastering or foundation-walls.

If "Engineer" will observe more closely the photographs of half-timbered houses in England and on the Continent he will see that only in the rudest kind of work are natural knees or flattened branches used. The timbers are nearly always hewn or sawn to shape. The regular ogee he refers to may be very ugly of itself, but there is nothing about the form which is constructionally or historically incorrect.

ARCHITECT.

* The appendices will be given with the concluding part of the paper.



DANGEROUS BOILER CONNECTIONS.

THE *Locomotive* says: "Probably the most dangerous style of connecting boilers that could be devised is that shown in Fig. 1, where each of two or more boilers is provided with its own stop-valve, so placed that steam can be shut into the boiler, while only one safety-valve is provided for the whole battery, this valve being placed upon the steam-drum beyond the stop-valves. Such an arrangement is bad enough when each boiler has its own

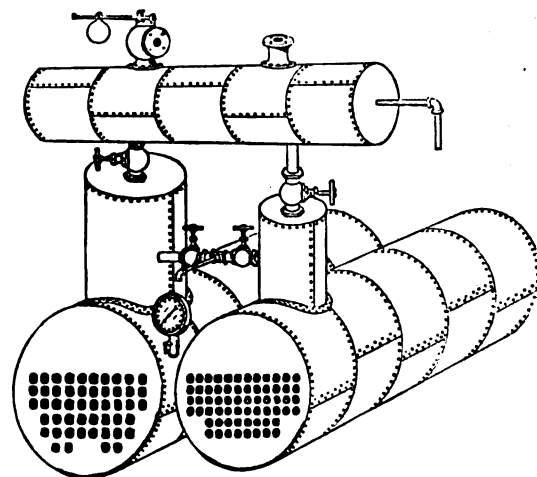


FIG. 1.

steam-gauge connected directly with the boiler, but it is doubly dangerous when but one steam-gauge is provided connected as shown in the figure. It will readily be seen that if one boiler is shut down for any reason, the stop-valve must be closed, and there will be a chance that when

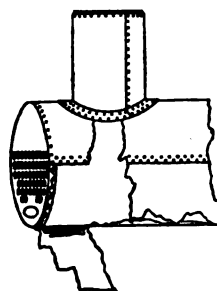


FIG. 2.

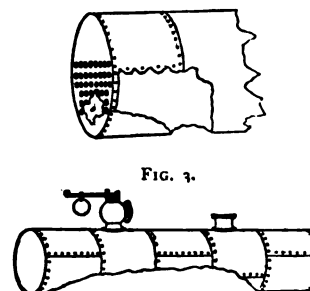


FIG. 3.



FIG. 4.

again put into use the attendant may forget to open the valve. If he does forget this there is almost a certainty that a rupture of some part of the boiler will result. We have known of several explosions which have occurred from this cause. The one from which the wreck shown in the illus-

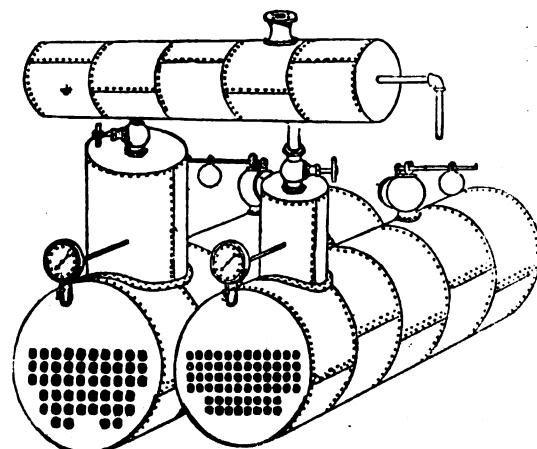


FIG. 5.

trations resulted occurred but a short time since. The owners of the boilers were careful and responsible men, who wanted things all right, and supposed when the boilers were set and connected that everything was as it should be. The steam-fitter, however, put the work up as shown in Fig. 1, and the owners, not being practically familiar with this kind of work, thought it was all right. For

some reason or other one boiler was shut down, and the steam-gauge removed for repairs. When the boiler was again fired up, the engineer neglected to open the stop-valve, and, there being no outlet for the steam or connection with the safety-valve, a terrific explosion followed, portions of the boiler being thrown over 700 feet. Figure 2 shows the front end of the left-hand boiler; Fig. 3 the rear end of same boiler, which was thrown nearly 300 feet, while Fig. 4 shows the upper portion of the steam-drum.

"We have had Fig. 5 engraved to show how these boilers should have been connected. A safety-valve for each boiler is placed directly upon the shell, there being no possible chance to cut off the communication with the boiler. Each boiler is also provided with its own steam-pressure gauge, directly connected. Had the boilers been connected in this manner, the explosion, with its accompanying loss of several thousands of dollars, would probably never have occurred."

[We are rather sorry to see the steam-fitter blamed for doing such work as is here illustrated and which undoubtedly was the cause of this explosion.

A steam-fitter did not do it. He was probably one of the itinerant "pipers" who go about the country taking a job at gas, steam, or any other kind of pipe work from any one who is foolish enough to employ him. But even if our surmise is not correct, there was woful ignorance on the part of some one besides the "steam-fitter." Who was the engineer, that knew no better than to consent to the use of such work, and why did he not protest to his employer if he was aware of the dangerous apparatus given into his charge? The owner is to blame in such a case for employing such an engineer.—ED. SAN. ENG.]

A SUBSTANTIAL VICTORY FOR THE PHILADELPHIA MASTER PLUMBERS' ASSOCIATION.

THE case wherein the master plumbers of Philadelphia denied the authority of the Board of Health to violate their own rules under the new plumbing ordinance, and in which they secured an injunction of the court restraining the board from further action and prohibiting the completion of the work, seems to have been definitely settled by the builder who was violating the rules, complying with them and laying the drain-pipes along the street inside the curb-line and draining the house thereto, instead of running the drain through the yards of the houses as proposed. The plumbers feel much gratified that this first case in question has been settled in their favor, and feel that while the rules undoubtedly need slight modifications, they are an immeasurable improvement over the old go-as-you-please style formerly in vogue among the craft, and that if these modifications are to be made they should be done in a legal and open manner.

PLUMBING IN THE TWELFTH REGIMENT ARMORY BUILDING IN NEW YORK CITY.

(Continued from page 427.)

We give below some additional features of the plumbing at the Twelfth Regiment Armory, which, our readers will remember, was illustrated in the preceding number.

Figure 8 shows the lavatory adjoining the gymnasium on the top floor. The arrangement of the pipes is simple and direct. The basin is oval, set in Italian marble, with trimmings of chestnut. The urinal is supplied with water from a separate cistern by chain-pull, and the wash-out water-closet by a valve in the large house-tank. The floor is of hard pine, and all trimmings, including wainscot, are of chestnut, with walls a plain sand finish. The window, being high up and large, gives plenty of light and air, both of which are so necessary in lavatories.

Figure 9 is a view of the Colonel's toilet-room on the ground floor. The ceiling is lower than the main room adjoining, and in the space so formed the water-closet and urinal cisterns are placed. Light and air is had from two loopholes in the front wall and the door of the room. The floor is of hard pine, with walls and ceilings a sand finish, the former tinted a "crushed strawberry" color. The fixtures are set in Italian marble, the only wood-work in the room being the water-closet seat. Altogether, the small space has been cleverly managed, and the not too abundant supply of light utilized by the bright trimming of the fixtures and the tone of the walls and ceiling.

Correspondence.

THANKS FOR THE HINT.

NEW YORK, September 4, 1886.

SIR: I have seen recently several statements in your paper regarding Western water-supply works having been designed by George W. Pearsons, C. E., of Kansas City. There was until recently in that city an accomplished water-works engineer named Galen W. Pearsons. Is this the same man who has changed his name, or is it another person, or has Mr. P. been rechristened by reporters who knew no G. W. but George Washington, and knew him only to avoid following his example in telling things?

ANTHONY OVER.

SIZE OF PIPE REQUIRED TO DRAIN A FIELD.

NEW YORK, September 30, 1886.

SIR: Will a 12-inch earthen pipe be large enough to carry off the water from a stone drain, two feet square and 700 feet long? The drain is simply a ditch two feet deep and two feet wide, filled with stones and covered over.

I can give the earthen pipe a fall of about 5 feet in 700. The field, which is 700 feet square, floods in rainy weather, and now takes from three days to a week to run off, and I want to keep it dry all the time if possible.

Yours truly, RODMAN SANDS.

[A 12-inch pipe would carry off the equivalent of about one-third of an inch of rainfall per hour on the area to be drained. Ordinarily, this would keep the field dry, but in very heavy rain storms there would be flooding of the field. A 20-inch pipe would insure perfect drainage.]

MATERIALS FOR DOORS OF TURKISH BATHS.

ROCHESTER, N. Y., September 15, 1886.

SIR: Will you please let us know what they line the doors in bath-rooms with when the heat is to be 180°, and oblige,

Very truly yours, B. & C.

[The proprietor of the Lafayette Place Turkish and Russian Baths in New York says: "Florida cypress is by far the best of all woods for doors, window-casings, and sills. It should be thoroughly kiln-dried, then given several coats of the best linseed oil, and finished rough dry, no paint, no flannel covering. Georgia pine and other woods decay quickly. All woods will shrink a little, but Florida cypress will shrink the least and last the longest."]

CATALOGUES OF BUILDING SUPPLIES WANTED.

ST. PETER'S MISSION, near Fort Shaw, Mont., }
September 21, 1886. }

SIR: We hope to build a large school here next spring, and you will greatly oblige us by letting us know what you consider the *safest* and most effective means of heating a building about 200x70 feet; also the best system of ventilation. We will build in rough rock and finish in hard woods. Please refer me to some dealers in hard wood (sycamore, ash, maple, etc.) in the neighborhood of the N. P. R. R. We should also like to receive descriptive catalogues of building materials, boilers, ventilators, parquetry, galvanized-iron baths, sinks, etc.

Very respectfully, SISTER MARY AMADEUS,
Superior of Ursuline Nuns.

[We print the foregoing, as our readers will doubtless supply the catalogues desired. We would suggest, however, the necessity of employing a competent architect, if our suggestion has not been anticipated. With the assistance and experience of such a man many mistakes will be prevented, much money saved, and more satisfactory results secured.

A perusal of "Heating and Ventilation," by John S. Billings, LL.D., Surgeon U. S. A., will give information regarding the different systems of heating. It is obtainable of the Book Department of THE SANITARY ENGINEER.]

CALKING JOINTS ON HOT-WATER PIPE.

MIDDLETOWN, N. Y., September 27, 1886.

SIR: Please inform me if it would be better to calk the bell-ends in 4-inch cast-iron green-house pipe with hemp packing and red-lead putty for hot water, or calk them with molten lead for expansion? Please answer a constant reader of your valuable paper.

P.

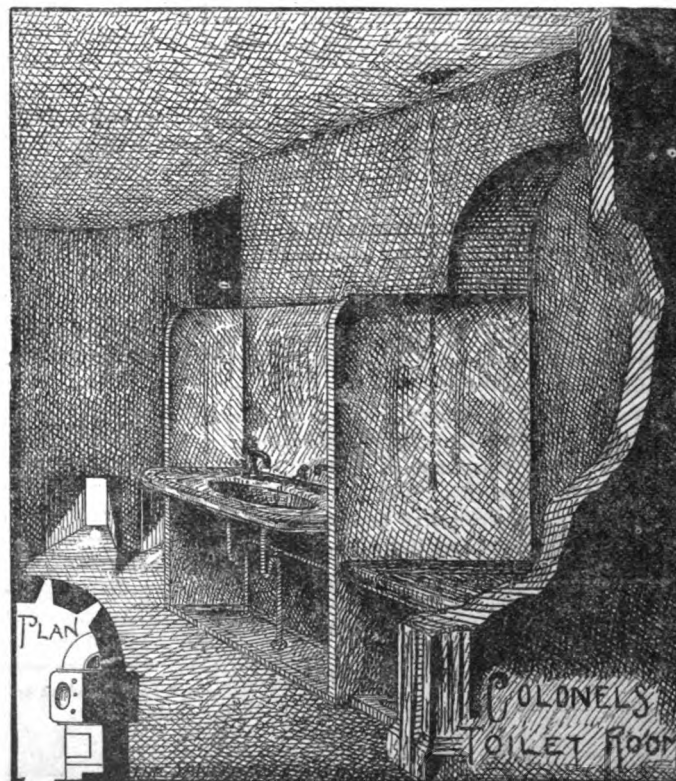
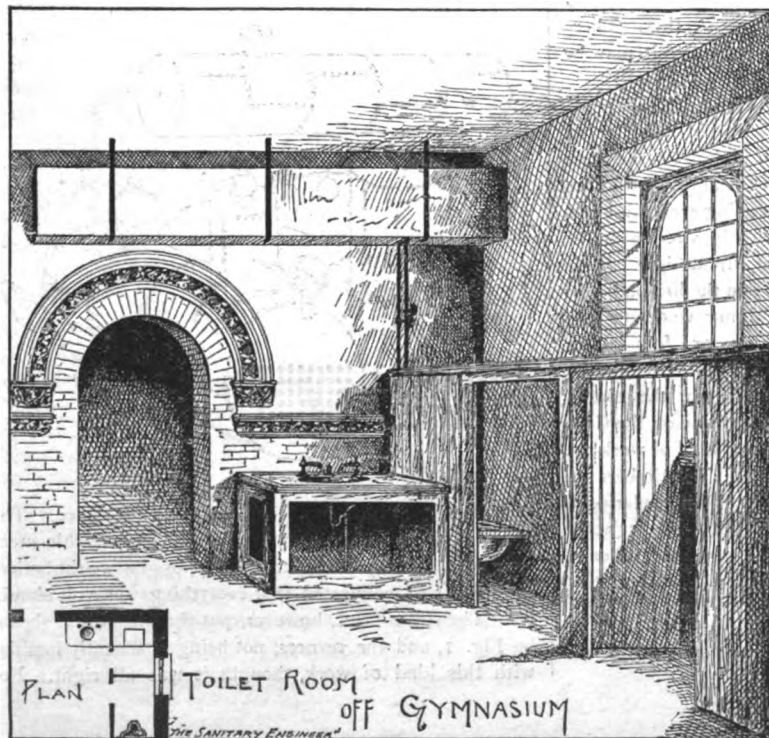
[Red lead and hemp are preferable.]

Novelties.

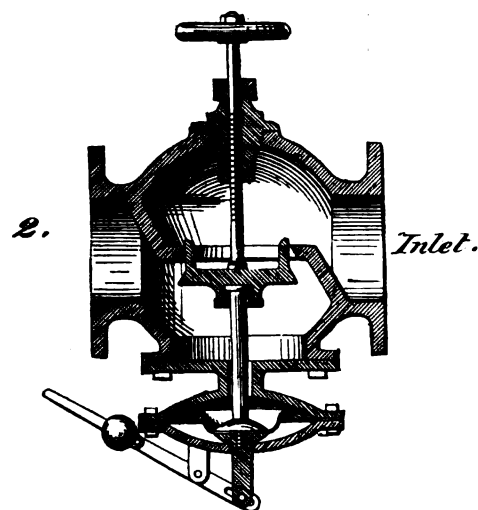
Under this heading we propose to describe and illustrate appliances of probable interest to our several classes of readers. The selection will be made without reference to the wishes of agents or patentees, being governed solely by considerations of novelty, ingenuity, and probable interest to readers, and especially the fact that they have not been elsewhere described. As a rule we shall make no comments, and it is to be distinctly understood that a notice does not imply approval. No charge will be made for these notices, and any offer of pay for their insertion will insure their omission. We shall be glad to have our attention called to novelties suitable for this section.

A BACK-PRESSURE VALVE FOR STEAM-HEATING SYSTEMS.

We illustrate this week a back-pressure valve just being put on the market. It is intended for use on steam-heating systems where the exhaust steam is utilized for



heating. There being no stuffing-box, the resistance due to friction is reduced to a minimum, the diaphragm taking the place of a stuffing-box. It is claimed not to exceed in variation one pound pressure. It is made in both globe



and angle form, and can be used on horizontal or vertical pipes. The wheel-handle is to facilitate opening the valve when it is desired to have it kept open during the summer season when the system is not in use. The illustration shows the valve open. The patentee and manufacturer is Mr. Timothy Kieley, 11 West Thirteenth Street, New York.

Gas and Electricity.

Illuminating Power of Gas in New York City.

Week ending	New York Gas-Light Company.	Manhattan Gas-Light Company.	Metropolitan Gas-Light Company.	Mutual Gas-Light Company.	Municipal Gas-Light Company.	Krickbocker Gas-Light Company.	Equitable Gas-Light Company.
October 2.....	26.60	22.24	21.97	31.20	30.97	22.34	31.90

E. G. LOVE, Ph.D., Gas Examiner.

AN electric-light company, with a capital of \$25,000, has been organized at Fremont, O.

THE Natural-Gas and Oil Company, of East St. Louis, has been incorporated by C. W. Spalding and William N. White.

THE newly-formed Citizens' Mutual Gas Company has concluded to pool issues with the old company, consolidating and putting up the price of gas to \$2 per 1,000 cubic feet.

THE Hudson, N. Y., Consumers' Gas-Light Company has been incorporated. The trustees are Nicholas R. O'Connor, George A. Comer, and Aaron C. Macy.

ORANGE, N. J., has contracted with the Thomson-Houston Electric-Light Company to furnish electric-lamps for street-lighting. The price is \$95 per lamp per year for those of 1,200 candle-power, and \$100 per year for lamps of 2,000 candle-power.

THE fund which was raised for the benefit of the family of the late F. W. Hartley amounted to £1,035. It is gratifying to learn that this amount exceeded the expectations of the committee. The larger part of the fund has been permanently invested for the benefit of the family.

RECENT tests at the Franklin Institute indicate that the amount of light produced by different methods from one pound of coal may now be taken upon an average as follows: With naked arc-lights, 150 candles (with shaded arc-lights not more than sixty per cent. of the full light is usually obtained); with incandescent-lights twenty candles, and with gas fourteen to seventeen candles. In this estimate steam-coal is supposed to be burned under a good boiler for the electric-lights, and the gas is supposed to be obtained from a bituminous coal.—*The Electrician*.

WE have already referred to the incandescent gas-lamp invented by Dr. Carl Auer von Welsbach, of Vienna. At the meeting of the British Association Mr. C. W. Cooke read a paper on the subject, the official abstract of which is given by the *Journal of Gas-Lighting*. After describing the burner, it says: "The light emitted is, at a distance,

hardly distinguishable from a 20-candle incandescent electric-lamp, and by a modification of the composition of the impregnating liquid a yellow light is obtained, resembling that of the best gas-lights, but much more brilliant, and with a saving of gas of from fifty to seventy-five per cent., and, being perfectly smokeless, it is incapable of blackening ceilings and internal decorations."

ACCORDING to the Brooklyn *Union*, that city is lighted by 825 electric-lamps and 11,137 gas-lamps. The former cost \$182.50 each per annum, and the average cost of the gas-lamps is \$21.50. When electricity was introduced it was on the basis of one electric-light taking the place of 7½ gas-lamps. In reality each electric-light replaces about 4½ gas-lamps. Had the substitution of electric-lamps for gas been effected on a basis of 1 to 7½, the former would even then have cost \$17,520 more than the gas-lamps, but as it is the city pays \$76,280 more for the electric-lights than the displaced gas-lamps would cost. Brooklyn's appropriation for street-lighting this year is \$360,000, whereas the city has incurred obligations amounting to \$390,000. If all the gas-lamps were replaced by electric-lights the city would have to pay \$633,600 for its street illumination.

THE following figures concerning the illuminating-gases of this city are abstracted from THE SANITARY ENGINEER from the report of the Gas Examiner for the quarter ending September 30, 1886:

	New York Gas-Light Company.	Manhattan Gas-Light Company.	Metropolitan Gas-Light Company.	Mutual Gas-Light Company.	Municipal Gas-Light Company.	Krickbocker Gas-Light Company.	Equitable Gas-Light Company.
Average Illuminating-power for the quarter.....	26.07	21.57	21.54	30.49	28.94	22.09	31.43
Sulphur, grs. in 100 cubic feet.....	3.26	5.12	29.45	5.17	2.85	7.30	3.45
Ammonia, grs. in 100 cubic feet.....	0.23	2.59	4.96	0.14	0.14	0.89	0.13
Specific gravity.....	.623	.515	.538	.720	.656	.619	.636

REGULATIONS GOVERNING THE IMPORTATION OF RAGS.

THE following circular has been issued by the Board of Health of Boston, Mass., in place of that requiring the disinfection within the bale, by a certain process, of rags arriving from foreign ports:

Ordered, That on and after October 1, 1886, any vessel arriving at this port, which has on board at the time of her arrival, or has had during her passage to this port, any sickness of a contagious or doubtful character which may be detrimental to the public health, or which has on board any rags, paper-stock, or any other cargo or personal baggage which has come from or has been in any port or place which has been epidemically infected with any contagious or infectious disease within the six months previous to such arrival, shall be anchored at quarantine.

All old rags will be regarded with suspicion and detained by the port physician, unless accompanied by a certificate of the United States Consular Officer at the port of departure, that such rags were not gathered, or baled at, or shipped from any place which has been infected with any contagious or infectious disease in an epidemic form within six months prior to the shipment of said rags.

Infected persons found on such vessels shall be removed to the hospital on Gallop's Island, and there detained until all power to infect others shall have ceased. Cargoes and personal baggage, which in the opinion of the port physician or the board of health may be infected, shall be removed to the storehouse on Gallop's Island and there disinfected, when such disinfection cannot be properly done on board the vessel. No such vessel shall proceed, nor shall her cargo or any part thereof be discharged, nor any person be allowed to go on board or to leave her while in quarantine, without the written permit of the port physician, who is hereby authorized and instructed to take such measures with regard to said vessel as, in his judgment, the health of the city may require.

All immigrants, on arrival at quarantine, shall be subjected to examination, as regards their protection from small-pox.

All persons under ten years of age who have not been successfully vaccinated, and all persons over ten years of

age who have not recently been successfully vaccinated or revaccinated, shall be considered as unprotected from the effect of the contagion of small-pox, persons having had an attack of small-pox excepted.

All persons not protected shall be vaccinated or subjected to a quarantine of observation, and for each vaccination the port physician shall impose and collect the sum of twenty-five cents, to be by him paid to the city treasurer. By order of the Board of Health.

S. H. DURGIN, Chairman.

THE ACTION OF WATER ON LEAD.

PROFESSOR CROOKES and Doctors Odling and C. Mymott Tidy contributed a valuable paper on "The Action of Water on Lead" to the proceedings of the recent meeting of the British Association. They find that the action of a soft water on lead pipes does not depend upon its degree of softness, but to the amount of silica it contains. Where the silica was as low as 0.3 grain per gallon the water dissolved the lead, but where it was more than 0.3 grain the water had no solvent action on the lead pipes. It is therefore recommended that the water should be filtered at the works, and that where necessary the filter-beds be so modified as to insure the silication of the water. They are inclined to the belief that when the amount of lead in the water does not exceed 0.05 grain per gallon it will not produce any hurtful effect.

"THE AMERICAN ENGINEERING MAGAZINE AND RAILROAD JOURNAL."

MR. M. N. FORNEY, one of the founders, and for a long time one of the conductors, of the *Railroad Gazette*, announces that he has become the owner of the *American Railroad Journal*, one of the oldest publications of its kind in this country or the world, as it has been published continuously since 1832. This will be consolidated with *Van Nostrand's Engineering Magazine*, which Mr. Forney has made arrangements to buy, under the title, "The American Engineering Magazine and Railroad Journal," and will be published monthly. The new periodical, though devoted to engineering and mechanical subjects, will give especial attention to railroad construction and operation, and it will have "more the character of a magazine than of a trade journal."

ON looking over the report for 1885 of Dr. J. Stopford Taylor, Medical Officer of Health of Liverpool, we notice that for the last fifteen years there has been a gradual but progressive improvement in the healthfulness of the city of Liverpool, as shown by the death-rates. From 1871 to 1875, the average rate was 29.5; from 1876 to 1880, it was 27.5; and from 1881 to 1885, 25.7 per 1,000 of population. In 1884 it was 25.1, being the lowest ever recorded for the city, and in 1885 it was 23.7. Dr. Taylor remarks that this improvement is due to sanitary measures, and no doubt the claim has a good foundation.

At all events Liverpool no longer has the undesirable notoriety of being the unhealthiest town in England. The most fatal zymotic disease during the year was measles, which caused 716 deaths. The most marked reduction occurred in the mortality from fever, the deaths from which were 182, as against an average of 378 for the last ten years. The work of improvement appears to be going on steadily; 376 houses were demolished during the year because of their insanitary condition, 1,284 privies were certified for conversion into water-closets, 2,076 houses were disinfected, and 138,924 houses were inspected. The report contains much information that is, or should be, of local interest, and we congratulate Dr. Taylor on the results which he is able to show.

AN indictment was found last week in the Court of Oyer and Terminer of Richmond County N. Y., against a firm of refiners and chemists of Staten Island for polluting the Kill von Kull by the discharge of refuse material into it.

PERSONS who sympathize with the good work of the New York Society for Prevention of Cruelty to Children may help the organization by sending contributions of money or clothing to the Treasurer, Mr. J. L. Jenkins, No. 100 East Twenty-third Street.

QUANTITIES of fish have been thrown up from a spouting artesian well at Aberdeen, Dak.

THE American Institute Fair opened in the Institute Building on upper Third Avenue in this city last week.

CONTRACTING INTELLIGENCE

For works for which proposals are requested, see also the "Proposal Column," pages 437, 438, and 440.

CONSTRUCTION.

BALTIMORE, MD.—The Union Bridge, Md., Water Company has contracted with Crook, Horner & Co., of Baltimore, to construct a system of water-works, and superintend the building of a 360,000-gallon reservoir. Proposals for this last were advertised October 2. Plans can be seen at the office of M. C. McKinstrey, president of the water company, at Union Bridge. The water-works will require 12,000 lineal feet of water-pipe, 17 fire-plugs and a compound steam pumping-engine.

CLEVELAND, O.—The Board of Water-Works Trustees has under consideration the construction of a reserve reservoir on the West Side in connection with a park improvement project which has been decided upon. President Sutton of the Water-Works Board can give further information.

MOBILE, ALA.—It is proposed to construct a pier from Alabama Port to the lower western shore of Mobile Bay, and dredge a channel. The total cost is put at \$350,000. Surveys have been made by Mr. Rudolph Benz.

CHELSEA, MASS.—On September 30 both branches of the City Council passed an order authorizing the City Treasurer to borrow \$40,000 on city bonds for a high-service water-supply.

BRIDGES.—The Kansas City, Wyoming, and Northwestern Railroad Company wants proposals for its bridge and trestle-work. Address Martin Kelly, Wyandotte, Kansas.

MEMPHIS WATER-SUPPLY.—W. S. Kuhn, general manager of a water construction company of Muncie, Ind., desires to put in water-works, and has communicated with President D. P. Hedden, of Shelby County Taxing District, in regard to making a proposition.

PORTCHESTER, N. Y.—The trustees of Portchester have decided to have sewers built in the principal streets.

PLATTSBROUGH, N. Y.—Mr. J. D. Cook, of Toledo, O., has been selected as the consulting engineer for the new water-works just begun by a syndicate of Boston capitalists, Messrs. Turner, Dillaway & Rawson.

OCALA, FLA.—A. Parker, of Huntingdon, Pa., has made a proposition to the citizens of Ocala to erect water-works there. He proposes to supply in eight months a system of water-mains with water and sixty-five fire-hydrants. He is to have the privilege for ten years of supplying water for fire and other public services at the rate of \$95 per hydrant, payable quarterly, and for private use on terms hereafter to be agreed on.

MILWAUKEE, WIS.—The County Committee on Public Buildings has adopted the cheapest plan of H. J. Hilbert, of Milwaukee, for a new pumping station at the county farm. The cost will be \$24,000, and the capacity 500,000 gallons per hour.

The contract for constructing a crib at the foot of Terrace Avenue, to protect the property from the encroachments of Lake Michigan, was given to W. T. Casgrain, on his bid of \$725. Thomas Butler offered to make test borings for the proposed Whitefish Bay conduit and Milwaukee River flushing tunnel for the sum of \$4.25 per foot. This was the only bid received. The contract was let, although the Board deemed the bid too high.

KENDALLVILLE, IND.—The question of water-works is being favorably discussed. Messrs. Keller & Alexander are interested.

CITY OF MEXICO.—Associated Press dispatches dated Memphis, Tenn., October 2, state that Roberto Gayol, Chief Engineer of the City of Mexico, has been in that city investigating the system of sewers. He will also go to Pullman, Ill. It has become necessary to reconstruct the sewerage of the city, and Signor Gayol has already begun the work. The sewage will be conveyed in a canal thirty miles to a tunnel which is now being pierced six miles through the base of a mountain, the ground on the other side being much lower than the city. The whole cost will be \$6,000,000.

SOUTH ORANGE, N. J.—A public meeting was held September 20, on the question of water-supply. The meeting was called by the Special Water Committee of the village Board of Trustees. Chairman Young, of the Water Committee, called the meeting to order. Mr. Edward Self was elected Chairman, and Edward D. Shepard, Secretary. Mr. Young presented a report of the investigations made by the Water Committee. He read the proposition of the syndicate who offered to organize as a water company, to secure and furnish a satisfactory water-supply, if the village would contract to pay \$50 per hydrant per year for water for fire purposes, and ten hydrants to be erected to the mile, and five miles of mains to be laid. He also read the several laws giving the Board of Trustees power to contract with any organized water company or aqueduct board for a water-supply, and to issue bonds in amount not exceeding one-twentieth of the property valuations for the introduction of a water-supply by the village. A resolution was adopted instructing the committee to continue their investigations of both the matter of introducing water and sewerage, to employ experts if necessary, and to report at a meeting of citizens to be called by them.

CINCINNATI.—A meeting was held here September 30 to consider plans for the bridge over the Ohio River between Cincinnati and Newport, in connection with the Chesapeake and Ohio Railroad system. The plans were submitted to a Board of U. S. Engineers, Col. W. P. Craighill presiding, and, after discussion as to change of height, were taken to Washington, from which city the decision of the engineers will be given. The estimated cost is \$2,000,000. The bridge is to be built by the Covington and Cincinnati Elevated Railroad Bridge and Transportation Company.

TOLEDO, O.—Proposals are advertised for lighting the city, also naming streets. Address City Clerk.

SWAMPSCOTT, MASS.—We have recently mentioned the propositions which Lynn has made to Swampscott to furnish a supply of water to the latter. The terms offered were not satisfactory, and on September 25 town meeting decided not to accept them, but to make a contract with the Marblehead Water Company.

DETROIT, MICH.—The city has decided to build a contagious disease hospital at an expense of \$10,260. The contracts were awarded as follows: Carpenter work, U. Armstrong & Son, \$8,400; plumbing, J. D. Mouat & Co., \$560; heating, T. P. Tuitt & Co., \$1,300.

COLUMBUS, O.—The following are the bids for marble work on the new public building: O. E. Fitch, New York, \$22,587; Harry De Witte, Cincinnati, \$38,968; Davidson & Sons, Chicago, \$19,806; Burlington Mfg. Co., Chicago, \$18,630; Pickett Marble & Granite Co., St. Louis, \$16,978; A. Klater, New York, \$27,990.

GOVERNMENT WORK.

ABSTRACT of proposals opened September 24, 1886, by Captain Charles E. L. B. Davis, Corps of Engineers, for the extension of piers and construction of superstructure at harbors as follows:

Ontonagon Harbor, Mich.: John H. Gillett, Marquette, Mich., \$13,146; A. S. Bretherton, Jackson, Mich., \$12,361; William T. Casgrain, Milwaukee, Wis., \$12,385.

Harbor of Refuge, Grand Marais, Mich.: Truman & Cooper, Manitowoc, Wis., \$27,053; Schwarz & Berner, Green Bay, Wis., \$28,288.50; A. S. Bretherton, Jackson, Mich., \$28,534; John H. Gillett, Marquette, Mich., \$31,700; William T. Casgrain, Milwaukee, Wis., \$29,929; Castle Sutherland, East Saginaw, Mich., \$23,140.

Kewauunee Harbor, Wis.: John Wrabetz, Kewauunee, Wis., \$8,149.26; Truman & Cooper, Manitowoc, Wis., \$8,223.70; Schwarz & Berner, Green Bay, Wis., \$7,265.32; Knapp & Gillen, Racine, Wis., \$7,303.80; William T. Casgrain, Milwaukee, Wis., \$8,732.20.

Manitowoc Harbor, Wis.: Truman & Cooper, Manitowoc, Wis., \$14,037; Schwarz & Berner, Green Bay, Wis., \$15,744; Knapp & Gillen, Racine, Wis., \$16,368; A. S. Bretherton, Jackson, Mich., \$22,779; William T. Casgrain, Milwaukee, Wis., \$20,255; Greve & Falge, Manitowoc, Wis., \$15,548.50.

Sheboygan Harbor, Wis.: Knapp & Gillen, Racine, Wis., \$12,050.60; Schwarz & Berner, Green Bay, Wis., \$11,892.10; Truman & Cooper, Manitowoc, Wis., \$10,791.60; A. S. Bretherton, Jackson, Mich., \$17,034.60; William T. Casgrain, Milwaukee, Wis., \$14,469.

Port Washington Harbor, Wis.: Knapp & Gillen, Racine, Wis., \$3,266.50; Truman & Cooper, Manitowoc, Wis., \$2,825; A. S. Bretherton, Jackson, Mich., \$3,810; William T. Casgrain, Milwaukee, Wis., \$3,254.

Bids of A. S. Bretherton for improvements at Ontonagon were informal, not being accompanied by a guarantee, and the contract will be let to William T. Casgrain at \$12,385. For the same reason the bid of Castle Sutherland, E. Saginaw, Mich., for work in Grand Marais Harbor, amounting to \$23,140, was thrown out, and the contract will be given to Truman & Cooper at \$27,053.

ABSTRACT of proposals for building dam and abutment of Lock No. 2, Great Kanawha Improvement, opened 12 M., September 24:

	Estimated Quantities.	Price.	Amount.	Price.	Amount.	Price.	Amount.	Price.	Amount.
Grubbing and clearing..... complete.	30,000	\$0.75	\$22,500	30,000	\$0.75	\$22,500	30,000	\$0.75	\$22,500
Excavation..... per cubic yard.	1,000	1.50	1,500	1,000	1.50	1,500	1,000	1.50	1,500
Rock excavation..... " " "	6,000	0.35	2,100	6,000	0.35	2,100	6,000	0.35	2,100
Embankment..... in place " "	1,000	1.00	1,000	1,000	1.00	1,000	1,000	1.00	1,000
Foundation..... " " "	10,000	1.00	10,000	10,000	1.00	10,000	10,000	1.00	10,000
Stone filling..... in place, cu. yd.	500	1.35	675	500	1.35	675	500	1.35	675
Hand-filled rip-rap in place, cu. yd.	500	4.00	2,000	500	4.00	2,000	500	4.00	2,000
Paving..... " " "	900	2.00	1,800	900	2.00	1,800	900	2.00	1,800
Rock-faced masonry..... " " "	300	16.00	4,800	300	16.00	4,800	300	16.00	4,800
Coping..... in place, per 1,000 ft. B. M.	30	10.00	300	30	10.00	300	30	10.00	300
Timber, in place, per 1,000 ft. B. M.	1,000	30.00	30,000	1,000	30.00	30,000	1,000	30.00	30,000
Iron, in place, per pound.....	51,000	0.05	2,550	51,000	0.05	2,550	51,000	0.05	2,550
Total amounts of bids.....			\$106,132			\$106,132			\$106,132
			\$37,610			\$37,610			\$37,610
			\$125,504.00			\$125,504.00			\$125,504.00
			\$120,890.00			\$120,890.00			\$120,890.00
			\$126,030			\$126,030			\$126,030
			\$13,495			\$13,495			\$13,495

SYRACUSE, N. Y.—Synopsis of bids for iron furring and lathing for Post-Office, opened September 27: Knisely & Miller, \$5,900; Haugh, Ketcham & Co. Iron-Works, \$3,295; John Cooper, \$3,385.44; John W. Hoyt, \$3,755.

RICHMOND, VA.—Synopsis of bids for 20,000 feet of granite stock for Custom House, etc., opened September 27: Westham Granite Co., Richmond Va., 55 1/2 cents per cubic foot; Richmond Granite Co., Richmond, Va., 49 1/2 cents per cubic foot; George Lumsden, Petersburg, Va., 80 cents per cubic foot.

IMPROVEMENT of Cumberland Sound, Georgia and Florida, opened September 30, by Col. Q. A. Gillmore, U. S. Engineers, New York City. Work to be done: Extending foundations of jetties, and raising jetties with mattresses and stone. Mattress to be constructed according to specification. Estimate of quantities, 60,000 to 70,000 square yards of mattress work, and 20,000 to 25,000 cubic yards of stone. Bids as here: P. S. Ross, Jersey City, 58c. per square yard of mattress and \$2.00 per cubic yard of stone; Rittenhouse Moore, Mobile, Ala., 48c. and \$3 respectively; A. M. Bangs, Fayetteville, 47c. and \$2.89 respectively; Lara & Ross, 54c. and \$3.04 respectively; E. H. Gaynor, Boston, 49c. and \$3 respectively. Work to begin by November 1. Monthly progress of at least \$12,000 worth.

IMPROVEMENT of Harbor of Charleston, S. C., opened September 30, by Col. Q. A. Gillmore, in New York City. Work to be done: The extending or widening of the foundations of one or both of the two jetties at the entrance of the harbor. It consists in laying upon the bottom, or upon work previously laid, one or more courses of a mattress overlaid with stone, and in putting stone alone upon work previously laid, mattress according to designs accompanying the specification. The quantities of material are estimated at 30,000 to 40,000 square yards of mattress work, and 15,000 to 20,000 cubic yards of stone. Bids as here: P. S. Ross, Jersey City, 85 1/2 c. per square yard of mattress, \$3.27 per cubic yard of stone; Rittenhouse Moore, Mobile, Ala., 53c., \$3.20 for respective items; Anson M. Bangs, Fayetteville, N. Y., 49c., \$3.09 respectively; A. A. Howlett, Syracuse, N. Y., 77c., \$3.83 respectively. Each bidder guarantees a monthly progress of at least \$12,000 worth of work; work to begin October 25. Contract awarded to Anson M. Bangs.

PHILADELPHIA, PA.—Proposals were opened at the United States Engineer's office, in this city, October 1, 1886, for the erection of a stone dike in the Delaware River, between Hog and Maiden Islands, and the following bids were received: William M. Field, Kentmere, Del., \$1.27 per cubic yard; Patterson & Vollmer, Philadelphia, \$1.43 1/4; Joseph H. Ward, Ridley Park, Pa., \$1.09; C. A. Brown, New York City, \$1.64; John A. Banker, New York City, \$1.40; John Satterlee, Englewood, N. J., \$1.39 1/4.

WASHINGTON, D. C.—A contract for \$6,150 has just been awarded to the Pennsylvania Construction Co. of Pittsburg, for the iron work of the new Pension Building. There were twelve bidders.

IMPROVEMENT of Brunswick, Geo., harbor, opened September 30, by Col. Q. A. Gillmore, U. S. Engineers, in New York City. Work to be done: Raising jetty by addition of mattresses and rip-rap stone, or stone alone, and protection of ends and sides by apron or bottom revetment composed of mattress overlaid with stone. Mattress to be constructed according to specification. Estimate of quantities: 2,500 to 3,500 cubic yards of mattress work, and 2,000 to 2,500 cubic yards of stone. Bids as here: Anson M. Bangs, Fayetteville, 70c. per square yard of mattress, and \$3.10 per cubic yard of stone; E. H. Gayner, Boston, 55c. and \$3 respectively. Contract awarded to Gayner. Work to begin by November 1, 1886.

IMPROVEMENT of Brunswick, Geo., Harbor, opened September 30, by Col. Q. A. Gillmore, U. S. Engineers, New York City. Work to be done: Deepening channel by dredging; funds available \$8,000 to \$11,000 (sand, loam, and clay). Bids as here: P. S. Ross, Jersey City, 26 1/2 c. per cubic yard; Morris & Cummings, New York, 29 1/2 c.; American Dredging Company, Philadelphia, 28c.; Jacob Paulsen, Savannah, 26c. Work to begin by November 1.

IMPROVEMENT of Savannah, Geo., harbor, opened September 30, by Col. Q. A. Gillmore, U. S. Engineers, New York City. Work to be done: Building up of wing-dams and training-walls in Savannah harbor and river, with successive courses, composed of log and brush mattresses, overlaid with rip-rap stone, and putting stone alone upon the works where required. Quantities estimated at 60,000 to 90,000 square yards of mattress work, and 20,000 to 50,000 cubic yards of stone. Bids as here: P. S. Ross, Jersey City, 52 1/2 c. per square yard of mattress and \$2.75 per cubic yard of stone; John F. Gaynor, Fayetteville, N. Y., 38c., \$3 respectively; Rittenhouse Moore, Mobile, Ala., 43c., \$2.90 respectively; A. M. Bangs, Fayetteville, 43c., \$2.90 respectively. Work to begin by November 1 at latest. Monthly progress guaranteed, \$12,000 worth. Contract awarded to John F. Gaynor.

IMPROVEMENT of Savannah, Geo., Harbor and River, opened September 30 by Col. Q. A. Gillmore, U. S. Engineers, New York City. Work to be done: Dredging about 125,000 to 250,000 cubic yards of material (mixture of coarse sand, loam, and small shells). Bids: P. S. Ross, Jersey City, 23 1/2 c. per cubic yard; Rittenhouse Moore, Mobile, Ala., 24 1/2 c.; Morris & Cummings, New York, 25 1/2 c.; John F. Gaynor, Fayetteville, N. Y., 19c.; American Dredging Company, Philadelphia, 25c.; Jacob Paulsen, Savannah, 25c. All agree to begin work by November 1. First four guarantee monthly progress of 12,000 cubic yards

dredged, American Dredging Company to finish June 30, 1887, and Jacob Paulsen monthly progress of 15,000 cubic yards. Contract awarded to John Gaynor.

RIVER AND HARBOR WORK.—The Bureau of Engineers in Washington has prepared a circular calling upon each army engineer to submit, as soon as practicable, an estimate of the funds required for such an examination as may be necessary to enable him to report in regard to the various localities named in the River and Harbor Bill which are assigned to his charge, whether it is worthy of improvement. On the receipt of the estimates for preliminary examinations, the officer will be notified of the amount allotted and available for his district.

NEW ORLEANS, LA.—Major B. M. Harrod, of the Mississippi River Commission, states that \$400,000 has been appropriated for building levees as follows: For levees on the line from Arkansas City to the Louisiana State line, including what is known as the Opossum Fork line, \$35,000; levees on the west bank of the Mississippi River between the Arkansas State line and the mouth of the Red River, \$100,000; Morganza levee, south of Red River, \$40,000; east bank of the river between Memphis and Vicksburg, \$100,000; and in connection with the work at Lake Providence, another \$100,000 for levee work. The commission will at once resume work at Plum Point and Providence Beach, where operations have been in progress for several years for the improvement of the navigation of the river. Work will also be commenced at the head of the Atchafalaya to prevent that stream from further washing out and enlarging its capacity as an outlet.

PERSONAL.

MR. THEODORE ROSENBERG, architect for the N. Y., P. & O. Railroad, at Cleveland, has accepted a similar position on the Colorado Midland Railway, headquarters at Colorado Springs, Col.

We learn that Mr. John C. Hoadley, C. E., of Boston, is seriously ill.

MESSRS. MCCROSSEN & BURKHOLDER, architects, have moved their office from Lynchburg, Va., to Charleston, S. C.

LATE NEW YORK BUILDINGS.

402-404 Greenwich st, br store; cost, \$54,000; o, A. H. Hatch; a, F. & W. Bloodgood.

72d st, s, 144 ft w of Gr. Boulevard, 3 br dwells; cost, ea, \$24,000; o, Wm. H. McCormack; a, C. P. H. Gilbert.

206-208 Mercer st, br stable; cost, \$10,000; o, R. Goert; a, J. M. Dunn.

9th av, n e cor 99th st, 2 br flats and stores; cost, ea, \$28,000; o, Wm. and Thos. Hall, a, J. C. Burne.

9th av, s e cor 100th st and 25, 50 and 150 ft n of 99th st, 3 br flats; cost, ea, \$21,000; o, Wm. & Thos. Hall; a, J. C. Burne.

9th av, e, s, 75 ft n of 99th st, 3 br flats; cost, ea, \$21,000; o, Wm. & Thos. Hall; a, J. C. Burne.

99th st, n s, 75 ft e of 9th av, and 100th st, s, 75 ft e of 9th av, 2 br flats; cost, ea, \$22,000; o, Wm. & Thos. Hall; a, J. C. Burne.

ANNOUNCEMENT.

The publication of the sixth revised edition of the U. S. Pharmacopoeia (1880), containing as it does much more strict requirements for the purity and strength of pharmaceutical preparations, has been followed in some States of the Union by the enactment of laws against the adulteration of drugs, which laws make the Pharmacopoeia the official standard.

In accordance with our established policy we shall, as in the past, use our best endeavors to furnish only such preparations as shall meet pharmacopoeial requirements.

We are heartily in sympathy with all efforts which aim to improve the quality of medicines, and shall continue as heretofore to exclude all low grade and inferior articles and to use our influence to promote the sale and use of pure drugs and medical preparations.

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Proposals.

(Continued from page 438.)

EXTENDING THE PILE DIKE AT THE MOUTH OF THE PASSAIC RIVER, N. J.

ENGINEER OFFICE, U. S. ARMY,
Room 31, Army Building, cor. Houston & Greene Sts.,
NEW YORK, September 30, 1886.

Sealed proposals for extending the Pile Dike at the mouth of the Passaic River, N. J., will be received at this office until twelve (12) o'clock, noon, on Wednesday, October 13, 1886.

Proposals must be made in triplicate. Specifications, blank forms and instructions to bidders may be had application to this office.

WALTER MCFARLAND,
Lieut. Col. of Engineers.

WASHINGTON, D. C., October 4, 1886.

Sealed proposals are invited for furnishing thirty-eight steam-heating radiators, with pipe, valves, and fittings, set in place, for heating the fourth story of the new Pension Building. Plans can be seen in this office, where specifications may be obtained. Bids received will be opened at 2 P. M. on October 20, 1886.

M. C. MEIGS,
Supervising Engineer and Architect.

U. S. ENGINEER'S OFFICE,
CLEVELAND, O., September 25, 1886.

Sealed proposals in duplicate, addressed to the undersigned, will be received at this office until 11 o'clock A. M., Monday, October 18, 1886, for delivering and placing 3,600 cords, more or less, of Rubble stone in foundation for the breakwater at Cleveland Harbor, O. Forms, specifications and other information can be obtained at this office.

The United States reserves the right to reject any or all proposals.

L. COOPER OVERMAN,
Major of Engineers.

DEPOT QUARTERMASTER'S OFFICE,
DAVID'S ISLAND, N. Y. H., September 24, 1886.

Sealed proposals, in triplicate, subject to the usual conditions, are invited and will be received at this office until Monday, October 25, 1886, at which time and place they will be opened in presence of attending bidders for furnishing and putting up a complete apparatus for lighting the new Mess-hall at David's Island, with the Gilbert & Barker Manufacturing Co.'s system, or other system equally good, in accordance with specifications on file in this office. Bids, instructions to bidders, and other detailed information furnished on application. The right to reject any or all proposals is reserved by the Government. Envelopes containing proposals to be marked "Proposals for Apparatus for Lighting Mess-Hall," and addressed to the undersigned.

GEO. H. COOK,
Capt. & Asst. Quartermaster, U. S. Army,
Depot Quartermaster.

DEPOT QUARTERMASTER'S OFFICE,
DAVID'S ISLAND, N. Y. H., October 2, 1886.

Sealed proposals, in triplicate, subject to the usual conditions, are invited and will be received at this office until Tuesday, November 2, 1886, 12 o'clock, at which time and place they will be opened in presence of attending bidders for furnishing and delivering, free of expense, for cartage or packages, the Quartermaster's Stores specified on schedule at this office. A preference will be given to articles of domestic production and manufacture, conditions of price and quality being equal, and such preference given to articles of American production and manufacture produced on the Pacific Coast to the extent of the consumption required by the public service there. The right to reject any or all bids or parts thereof is reserved by the Government. Envelopes containing proposals should be marked "Proposals for Quartermaster's Stores, November 2, 1886," and addressed to the undersigned. Blank forms, &c., furnished on application.

GEO. H. COOK,
Capt. & Asst. Quartermaster, U. S. Army.

PROPOSALS FOR DREDGING.

ENGINEER OFFICE, U. S. ARMY,
NEWPORT, R. I., October 4, 1886.

Separate sealed proposals, in triplicate, will be received at this office until 12 o'clock, noon, on Wednesday, the twenty-seventh day of October, 1886, at which time they will be opened in presence of bidders, for dredging in Hyannis Harbor, Mass., Pawtucket River, R. I., Providence River, R. I., Pawcatuck River, R. I., and Conn., and the removal of Green Jacket Shoal, Providence Harbor, R. I.

The United States reserves the right to reject any or all proposals and to waive defects.

Specifications, blank proposals and full information as to the manner of bidding, conditions to be observed by bidders, and terms of contract and payment, will be furnished on application to this office.

GEORGE H. ELLIOT,
Lieut. Col. of Engineers.

RUBBLE STONE. 16,665 cubic yards of rubble stone and 5,500 cubic yards of large stone for Rouse's Point, N. Y. Until October 15. Address Major M. B. Adams, U. S. Engineers, Burlington, Vt.

Proposals.

PROPOSALS FOR RIP-RAP GRANITE.

ENGINEER OFFICE, U. S. ARMY,
NEWPORT, R. I., October 4, 1886.

Separate sealed proposals, in triplicate, will be received at this office until 12 o'clock, noon, on Wednesday, the twenty-seventh day of October, 1886, at which time they will be opened in presence of bidders, for furnishing rip-rap granite for the eastern jetty at Nantucket, Mass., and the eastern breakwater at Stonington, Conn. The United States reserves the right to reject any or all proposals and to waive defects.

Specifications, blank proposals, and full information as to the manner of bidding, conditions to be observed by bidders, and terms of contract and payment, will be furnished on application to this office.

GEORGE H. ELLIOT,
Lieut. Col. of Engineers.

IRON ROOF, ERIE, PA.—Treasury Department, Office of the Supervising Architect, Washington, D. C., September 30, 1886. Sealed proposals will be received at this office until 2 P. M. on the 18th day of October, 1886, for furnishing and fixing in place the iron roof required for the Court House, etc., building at Erie, Pa., in accordance with drawings and specifications, copies of which and any additional information may be had on application at this office or the office of the Superintendent. Bids must be accompanied by a certified check for \$500. M. E. BELL, Supervising Architect.

IRON WORK, MINNEAPOLIS, MINN.—Treasury Department, Office of the Supervising Architect, Washington, D. C., September 28, 1886. Sealed proposals will be received at this office until 2 P. M. on the 11th day of October, 1886, for furnishing and fixing in place the iron columns, girders, and beams required for the Post-Office, etc., building at Minneapolis, Minn., in accordance with drawings and specifications, copies of which and any additional information may be had on application at this office or the office of the Superintendent. Bids must be accompanied by a certified check for \$500. M. E. BELL, Supervising Architect.

STONE AND BRICK WORK AT MACON, GA.—Treasury Department, Office Supervising Architect, Washington, D. C., September 30, 1886. Sealed proposals will be received at this office until 2 P. M. on the 23d day of October, 1886, for furnishing the materials and constructing all the masonry above the concrete foundations, required for the Court-House, Post-Office, etc., building in Macon, Ga., in accordance with drawings and specification, copies of which and any additional information may be had on application at this office or the office of the Superintendent. Bids must be accompanied by a certified check for \$1,500. M. E. BELL, Supervising Architect.

ROOF SLATE AT LYNCHBURG, VA., COUNCIL BLUFFS, IA., AND ERIE, PA.—Treasury Department, Office of Supervising Architect, Washington, D. C., September 28, 1886. Sealed proposals will be received at this office until 2 P. M. on the 9th day of October, 1886, for supplying and delivering at the Public Buildings, in the above-named cities, all the slate required for roofing purposes, in accordance with specification, copies of which and any additional information may be had on application at this office or the office of the Superintendent. Bids must be accompanied by a certified check for \$300. M. E. BELL, Supervising Architect.

STONE AND IRON WORK FOR APPROACHES, TOLEDO, OHIO.—Treasury Department, Office Supervising Architect, Washington, D. C., October 2, 1886. Sealed proposals will be received at this office until 2 P. M. on the 25th day of October, 1886, for furnishing and putting in place the street curbing, coal vault, stone and brick fence, and Belgian block paving, grading, sodding, and the artificial stone paving for sidewalk, and all iron work required for the approaches for the Custom-House, etc., building at Toledo, Ohio, in accordance with drawings and specifications, copies of which and any additional information may be had on application at this office or the office of the Superintendent. Bids must be accompanied by a certified check for \$200 for stone and brick work, grading, etc., and for \$300 for artificial sidewalks, and for \$200 for the vault work, and for \$200 for the iron work. M. E. BELL, Supervising Architect.

CARPENTER WORK AT CONCORD, N. H.—Treasury Department, Office of the Supervising Architect, Washington, D. C., October 4, 1886. Sealed proposals will be received at this office until 2 P. M. on the 18th day of October, 1886, for furnishing and putting in place the wood beams, roof-framing, and covering required to enclose the Post-Office, etc., building at Concord, N. H., in accordance with drawings and specification, copies of which and any additional information may be had on application at this office or the office of the Superintendent. Bids must be accompanied by a certified check for \$200. M. E. BELL, Supervising Architect.

BREAKING UP AND REMOVING ROCKS. Proposals will be received until October 26, 1886, for breaking up and removing rocks from the channel of the Ohio River at the Grand Chain. Address Lansing H. Beach First Lieut. of Engineers, U. S. Engineer's Office, Custom-house Cincinnati, O.

GRANITE for dry-dock at Mare Island, Cal. Until October 13. 49,000 cubic feet more or less. Address D. B. Hanning, Chief of Bureau of Yards and Docks, Navy Department, Washington, D. C.

REPAIRS to post hospital. Until October 11. Address Captain D. D. Wheeler, U. S. A., Presidio of San Francisco, Cal.

PROPOSALS will be received until October 12, 1886, for the boring of artesian wells at Toledo, O. Address City Engineer, Toledo.

STREET-PILING. Until October 11. Address Montgomery Sicaud, Ordnance Office, New York City.

IRON BRIDGE over Klinge Ford, on Rock Creek, District of Columbia. Until October 14. Length of bridge between end piers 87½ feet; clear width of roadway 20 feet, and to sustain a moving load of 100 pounds per square foot of roadway surface, in accordance with general plans and specifications on file in the office of the Engineer Commissioner, D. C. The abutments will be constructed by the District of Columbia, and will be ready for the bridge. Bidders must submit with their bids detailed plans and specifications of the bridge they propose to construct. Address William Ludlow, Engineer Commissioner, D. C.

Proposals.

REPAIRS TO BUILDINGS at St. Francis Barracks and Fort Marion, Fla. Until October 9. Address Lieutenant Sebree Smith, Acting Assistant Quartermaster, U. S. A., St. Augustine, Fla.

EARTH FILLING and stone paving for Davis Island, O., dam. Until October 19. Address Lieut. Lansing H. Beach, U. S. Engineers, Custom House, Cincinnati, O.

PUMPING-ENGINES. Until October 16. Two pumping-engines, capacity 14,000,000 gallons in 24 hours, against a maximum pressure of 100 pounds per square inch. Proposals for three types as follows: First, for two horizontal, compound, duplex, guaranteed to perform a duty equal to raising fifty million pounds of water one foot high with the steam generated by the consumption of 100 pounds of bituminous coal. Second, for two horizontal, compound, duplex, guaranteed to perform a duty of eighty millions under the same conditions as stated above. Third, for two vertical double-acting, compound, beam, and fly-wheel, guaranteed to perform a duty of not less than ninety millions, under the same conditions as above. An evaporation of nine pounds of water per pound of coal consumed will be guaranteed. The plunger speed for horizontal pumps shall not exceed 100 feet per minute, and for vertical pumps 150 feet per minute. The engine-room is 43½ feet, and 40 feet high. Foundations will be furnished by the water-works. Proposals will not be entertained for any type of engine not now in successful operation for some public water-supply. The proposals to include all necessary steam-pipes and valves, all water-pipes, including suction and discharge mains to outer walls of engine-room, and one foot-valve of a size sufficient for the supply of both pumps. Approved engine-registers, steam, water, and vacuum gauges, and all tools necessary for the proper care and working of the engines. Also, two approved duplex boiler feed-pumps, with plungers not less than 6x10 inches. One engine, if of low-duty type, to be completed and erected within seven months from date of award of contract, and the second one (if the contract be awarded for two) two months later; if either of the high-duty types is adopted, two months' extension of time will be allowed. Bidders will state the price for one engine or two engines. Address John H. Whitelaw, Superintendent of Water-Works, Cleveland, O.

GRANITE FOR DRY-DOCK for Mare Island, Cal. Until October 13. Address D. B. Hanning, Chief of Bureau of Yards and Docks, Washington, D. C.

BUILDING COURT-HOUSE, Pulaski County, Ark. Until October 10. Address County Judge Hill. The architect is Max Orloff, of Little Rock.

RUBBLE STONE, delivery of 150,000 tons. Until October 13. Address Major G. L. Gillespie, U. S. Engineers, Post-Office Building, Boston, Mass.

REMOVING DREW'S ROCK AND JETTY, Housatonic River, Conn. Until October 13. Address Col. D. C. Houston, U. S. Engineers, Army Building, Houston and Greene Streets, New York City.

REPAIRING DIKES in the Connecticut River above Hartford, Conn. Until October 13. Address Col. D. C. Houston, U. S. Engineers, Army Building, Houston and Greene Streets, New York City.

EXTENDING THE NEW HAVEN, CONN., BREAKWATER. Until October 13. Address Col. D. C. Houston, U. S. Engineers, Army Building, Houston and Greene Streets, New York City.

INCREASING HEIGHT OF EAST JETTY at Saybrook, Conn. Until October 13. Address Col. D. C. Houston, U. S. Engineers, Army Building, New York City.

CONSTRUCTING A DIKE on the Thames River, Conn. Until October 13. Address Col. D. C. Houston, U. S. Engineers, Army Building, New York City.

EXTENDING DIKE in New Haven Harbor, Conn. Until October 13. Address Col. D. C. Houston, U. S. Engineers, Army Building, New York City.

INCREASING HEIGHT OF DIKE in the Connecticut River at Hartford, Conn. Until October 13. Address Col. D. C. Houston, U. S. Engineers, Army Building, New York City.

ORDNANCE SUPPLIES for Rock Island, Ill., Arsenal. Until October 16. Address Col. T. G. Baylor, U. S. A., commanding Arsenal.

GRAVEL ROADWAYS, curbing and sewers. Until October 16. Quantities: 23,000 sq. yds. gravel roadway on Telford foundation; 25,000 sq. yds. gravelled road surface; 6,500 lin. ft. of wood curbing; 6,000 cu. ft. of pipe sewer. Address Bryan Callaghan, Mayor of San Antonio, Tex.

GRADING, CURBING, ETC., 2,000 lineal feet of Crawfish Pond, Cincinnati, Until October 18. Address Thomas G. Smith, President of Board of Public Affairs, Cincinnati, O.

FURNISHING TIMBER, ETC., to navy yards. Until October 15. Address D. B. Hanning, Acting Secretary of the Navy for Bureau of Construction and Repair, Washington, D. C.

BUILDING CRIB on Davis Island Dam. Until October 16. Address Lieut. Lansing H. Beach, U. S. Engineer Office, Cincinnati, O.

DREDGING, ETC. The dredging and removal of about 30,000 cubic yards of material from Scituate Harbor. Until October 13. Address Major G. L. Gillespie, U. S. Engineers, Post Office Building, Boston, Mass.

MACADAMIZED ROADING for National Military Cemetery, Knoxville, Tenn. Until October 14. Address R. N. Batchelder, Deputy Q. M. General, U. S. A., Office of National Cemeteries, Washington, D. C.

DREDGING in Plymouth, Mass., Harbor, about 18,000 cubic yards of material. Until October 12. Address Major G. L. Gillespie, U. S. Engineer Office, Boston, Mass.

FURNISHING RUBBLE STONE, about 18,000 tons, in Newburyport, Mass. Until October 12. Address Major G. L. Gillespie, U. S. Engineer Office, Boston, Mass.

PORCELAIN-LINED iron bath-tubs, mantels, hearths and grates, gas-fixtures, steam-heating apparatus for bath-houses, concrete floors, water-hydrants and fire apparatus. Until October 11. Address Captain Charles H. Ingalls, A. Q. M., U. S. A., Hot Springs Ark.

BUILDING INTELLIGENCE.

(Continued from page 449.)

BROOKLYN—(Continued).

Floyd st, n s, 340 e Nostrand av, 5 3-story frame stores and tens, and Floyd st, s s, 215 e Nostrand av, 10 3-story frame (br filled) stores and tens; cost, each, \$4,000; o and b, L. Michel and H. Roth, 128 Meserole st; a, H. Vollweiler.

11th st, s s, 70 w 5th av, 4-story brown stone store and ten; o and c, Sampson B. Oulton, 188 11th st; a, W. H. Wirth; m, J. Wyeth.

ALTERATIONS, NEW YORK.

1st av, n w cor 25th st; cost, abt, \$6,000; o, Anna Kruse, 343 E. 25th st; agent, A. T. Kruse; a, Robert Mook.

23 Wooster st, 2-story br exten for factory and dwell; cost, \$5,000; o, Abraham Bernheimer, 363 W. 55th st; a, C. A. French & Co.; b, not selected.

MISCELLANEOUS.

ATLANTA, GEO.—N. E. Harris, of Macon, Geo., President of the Commission on the Technological School, can give information about the buildings of the Technological School, which will be located here or at Athens.

BALDWIN, MICH.—Plans have been completed for a court house and jail by Architect Sidney Osgood, of Grand Rapids, to cost about \$15,000.

BOSTON, MASS.—549-551 E 6th, br dwells; cost, \$15,000; o and a, D. W. Beckler.

286 Newbury st, br dwell; cost, \$45,000; o and b, S. W. Merrill.

Market st, near School st, fr poultry-house; cost, \$5,000; o, J. A. Sawyer; b, M. A. Roberts.

183-189 Havre st, fr dwells; cost, \$15,000; o, E. M. McPherson; b, D. B. McPherson.

440-50 E 7th st, fr dwell; cost, \$20,000; o and b, James N. Devine.

BRIDGEPORT.—P. T. Barnum will build a school-house, accommodating 100 pupils, which he will lease to the city.

BALTIMORE, MD.—Centre near Front sts., four 3-story br dwells; o, Wm. McSweeney.

Chester near Hampstead, two 3-story br dwells; o, August Wehn.

Preston and Wilcox, chapel; o, Evang'l Church.

Clark and Fremont, stone church; o, Trinity Ev. Ch.

McCullon and Wilson, three 3-story br dwells; o, I. C. Morris.

BROOKLINE, MASS.—A new grammar school building, after plans of Peabody & Stearns, of Boston, will be built on Boylston Street. G. F. Joyce is secretary of the building committee.

BURLINGTON, VT.—G. M. Delaney will build a hotel on St. Paul Street, 118 x 75 ft., 3-stories.

CHATTANOOGA, TENN.—Rev. G. W. Dumbell, rector, can give information about a proposed Episcopal Chapel in the fifth ward.

CINCINNATI, O.—Molitor bet. Highland and Bellevue, 2½-story fr res; cost, \$8,000; o, S. Fritz; b, F. Wibbelsmann.

Rose bet. 2d and Front, 1-story br ware-house; cost, \$5,000; o, Monarch Oil Co.

Park ave. bet Cemetery and Windsor sts, 2½-story fr res; cost, \$10,000; o, S. Fritz; b, J. H. Finnegan & Co.

Plumm st, R. C. br school house; cost, \$12,000; o, St. Peter's Cong.; b, Wm. Ambers.

CLEVELAND, O.—In progress: 5-story br block, Ontario near High st; o, Bradley Estate; cost, \$35,000.

Building for Jewish Orphan Asylum, Woodland ave; cost, \$150,000.

COLORADO SPRINGS, COL.—Mr. Theodore Rosenberg, architect, is preparing plans for stone buildings for the Colorado Midland Railway at this place. The cost will be about \$200,000. Among the buildings will be a machine shop, round house, boiler shop, blacksmith shop, and structure for general offices.

BUILDING INTELLIGENCE.

CHICAGO, ILL.—3516-18 Wabash av, br dwell; cost, \$10,000; o, Catharine Lamb. J.

382-400 Jackson, br school house; cost, \$67,000; o, the city; a, J. J. Flanders; b, Aug. Loula.

18th st and Alport av, st and br priory; cost, \$15,000; o, Benedictine Order; a, F. Layer; b, M. Holie.

538 Dearborn, br dwell; cost, \$12,000; o, D. A. Tolwan.

415-17 Douglas av, br flats; cost, \$10,000; o, Paul Muehlmann.

450-52 La Salle av, br dwell; cost, \$17,000; o, D. Murphy.

12-24 Homer, and 2130 La Salle, br cottages; cost, \$13,000; o, H. Sweet.

292-306 22d st, br st and flats; cost, \$45,000; o, same as last.

42-44 Meridian, br factory; cost, \$25,000; o, E. D. Ellis.

3649-51 Prairie av, br dwell; cost, \$12,000; o, T. S. Walker.

89 Paulina, br addn. dwell; cost, \$10,000; o, W. Porter.

66-68 Bryant av, br dwell; cost, \$10,000; o, Thos. Edgar and H. H. Murray.

114-16 Oak, br flats; cost, \$10,000; o, P. M. Peterson and N. Anderson; a, C. O. Hansen.

419-21 Webster av, br st and flats; cost, \$20,000; o, F. Wandrey.

947-49 Milwaukee, br st and flats; cost, \$15,000; o, P. J. Benson; a, C. O. Hansen.

DETROIT, MICH.—76 Winder, br dwell; cost, \$12,000; o, C. Davison; a, E. E. Meyers & Son; b, J. B. Palmer.

28 Hendric, br dwell; cost, \$14,000; o, E. H. Deyo; a, John R. Gentle.

206 Michigan av, br store; cost, \$13,500; o, G. H. Prentiss; a, H. Pratt.

DAVENPORT, IOWA.—The Turner Society will build a costly building. The committee is A. Lerch, H. Korn, William Reuter, and M. Huebinger.

ERIE, PA.—E 6th st, veneered br 2-story bldg, 36x64; cost, \$4,000; o, Mrs. R. J. Saltoman; a, D. K. Dean; b, McDonald Bros.

GRAND RAPIDS, MICH.—Plans are completed by Mr. Sidney Osgood, architect, for a business block for C. M. Linnington, of Chicago, Ill., to cost about \$12,000.

HANCOCK, ME.—Ex-Senator Yulee, of Florida, has bought a 40-acre tract near here and will build a costly residence.

HOT SPRINGS, ARK.—2-story fr hotel; cost, \$5,575; o, Judge Boyle, Memphis; a, P. J. Ledwidge.

HOPKINTON, MASS.—Br block, stores and ten; cost, \$8,000; o, E. L. Bridges; a, Barker & Nourse; b, not let.

(Continued on page 453)

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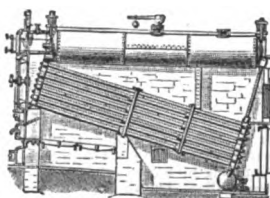
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ASPHALT PAVEMENTS AFFECTING VALUE OF PROPERTY.

SOME ten or twelve years ago an effort was made to pave Fifth Avenue with the bituminous pavement that wore so well in front of the Worth Monument, until it was replaced in the fall of 1879 by one of an inferior description; but the property-owners on the avenue, with great unanimity, petitioned the legislature against the projected improvement, asserting that it contained a job, and charged complicity between the projectors and the Health Department that endorsed the plan. Their opposition was effective, and since that time they have enjoyed the advantages of the worst pavement in the city, and probably the worst in any city of a million inhabitants in the world.

Finally, when after trials and tribulations the citizens of that thoroughfare have got a noisy and dirty pavement, which in due time will be broken up for the laying of steam, gas, and electric-wire pipes, they may well look to the example of Cincinnati and see how blind and short-sighted they were ten years ago, when they so persistently and successfully opposed the laying of the asphalt pavement referred to. If not comforting for them to know, it may be valuable to other citizens to learn that Cincinnati, which is now spending about four million dollars in putting down decent pavements, about three months ago completed the pavement of Race Street with asphalt. A gentleman residing on the street informs us that immediately after the completion of this pavement the wheel traffic from the city was apparently concentrated there; that there is no noise, no dust, and every night the street is thoroughly cleaned. Moreover, property has been sold at an advance of 33 1/3 per cent. over any figures heretofore obtainable, and with the prospect of still higher prices.

This enhancement of the value of property along the line of a well-paved street is only a repetition of the experience of every city that has laid down and maintained decent pavements.

In thus endorsing an asphalt pavement we do not wish to be understood as recommending it for every street and under all circumstances; and though we would like to have seen it on Fifth Avenue, yet we admit there are one or two spots on that avenue where the grade would demand a different pavement. But we have no hesitation in predicting that if any of the cross-town streets in the upper part of the city should secure a properly laid asphalt pavement from river to river, property would be enhanced in value, as was the case in Cincinnati.

MUNICIPAL IGNORANCE IN GREEN BAY, WIS.

IT is hard to understand how men holding public positions of trust in a thriving Western town of ten thousand inhabitants can be so far behind the present state of knowledge and public sentiment regarding the removal of foul waters from their midst, and the form of channel

best adapted to the purpose, as to publicly advocate the construction of a square stone drain in preference to a circular pipe-sewer.

But this is what three Aldermen of Green Bay in Wisconsin have recently done, as reported in the newspapers of that city. They have doctors there who know better—and architects too, for that matter—but they have also what one of the Aldermen termed “an expert who is a recognized authority in such matters, but did not want his name drawn into any controversy,” and who was at another time alluded to as “the best authority on the sewerage question in that part of the country,” who thinks that a square box-drain, three feet square, 1,100 feet long, built of stone, and two feet under ground, with a gradient of two and one-half inches in 100 feet, emptying into a river, with its top one foot below the average stage of water in the river, “is perfectly adapted to the purpose” of carrying off the house drainage as well as the rain-water from a large district. It is not strange that that “expert” did not want his name mentioned.

One of the Aldermen explained to the “Business Men's Association” that the house-drains were to connect with the bottom of this drain, and that as there would always be at least six inches of water on the bottom at the upper end, there would be no danger of sewer-gas entering the house-drains. With this a doctor present was much gratified, but another Alderman went on to expatiate on the perfect nature of the proposed plan, inasmuch as there is a daily fluctuation of eighteen inches in the surface of the Fox River, and the receding tide “will cause the impregnated water to run out, and its place will be taken with clean water, and thus the sewer will be thoroughly washed out twice each day.”

The “business men” don't seem to have taken much interest in the matter, for the Common Council have awarded a contract for building this absurd structure, which will inevitably be a nuisance, if it does not produce disease.

THE FIFTH AVENUE PAVEMENT INSPECTION.

GENERAL NEWTON has a disagreeable task in endeavoring to secure the completion of the pavement of Fifth Avenue in accordance with the specifications of the contract. The contractor has been reinforced by the reactionary effect bound to follow such a report as that made by Col. George T. Balch to the Commissioners of Accounts, to which we alluded last week, which the more closely it is examined more clearly reveals its weakness as an engineer's report. Moreover, the citizens of Fifth Avenue are greatly inconvenienced, and the shopkeepers' business is seriously suffering. Under the circumstances, the recommendation of the Corporation Counsel that Commissioner Newton and the contractor each appoint an engineer, who shall select a third if unable to agree to settle the dispute, is the most practicable suggestion for the solution of this problem. It may be necessary, in order to obtain reliable legal evidence in anticipation of possible litigation,

that each of the pavement blocks not yet laid on Fifth Avenue should be accurately measured. We presume this is the Commissioner of Public Works' reason for having five or six men engaged in that business, to the amusement of passers by. He, however, should know that at the rate at which his men are working, as we timed them the other morning, it costs about one cent to measure each block. By holding a watch, we noticed that in five minutes thirteen stones had been measured. To accomplish this feat there were present three inspectors, two laborers, and one tallyman. At this rate of progress, without stoppage for moving or talking through the eight hours the city employees work, 1,280 blocks would be inspected per day—not a comforting prospect. There are are probably good reasons for measuring these blocks—a proceeding neglected by a former administration—but those who want to belittle the efforts of the Commissioner to get contractors to live up to their contracts should not be encouraged by the "sogering" of the department's own employees.

OUR BRITISH CORRESPONDENCE.

Congress and Exhibition at York—Glass Sleepers—Importance of Making Ceilings and Floors Impervious to Dust—Health of Sewer Men—Sewage Sediment Used in Mortar.

LONDON, September 25, 1886.

THE ninth congress and exhibition promoted by the Sanitary Institute has just been opened at York. Sir Spencer Wells, Bart., F. R. C. S., as President, in his inaugural address, pointed out the necessity of elaborate co-operation in order to bring about any great sanitary improvement. He pointed out that though a great deal of investigation had been got through, legislation did not keep pace with it. Referring to the fall in the death-rate, he showed that whereas statistics in 1837 indicated that the average length of life in Great Britain was only thirty years, it is at present forty-nine years. He expressed a hope that, with a diminution of the waste of time from party struggles in the Houses of Parliament, there might be more attention accorded to legislation for the good of all classes.

in the wooden flooring, and accumulated until they had the effect of breaking down the ceiling below. The stuff was, of course, quite useless for any business purposes, and, in addition to the resulting loss, there was the expense of substituting a new ceiling.

The following is of interest as showing the health of sewer men, notwithstanding the nature of their occupation and the fact that they spend some seven or eight hours per day in the sewers, often in cramped-up positions. In his report to the vestry the Surveyor of Chelsea stated that one of the sewer men, now pensioned, is eighty-six years old and was engaged at his occupation for more than twenty-eight years; another, yet at work, is seventy-four, and has been at work more than thirty years; another is seventy-five, at work thirty-eight years; another, of fifty-five, at work thirty-six years, has never had a day's illness or consulted a doctor throughout that time. The remaining three men employed by the vestry in this occupation are younger, but enjoy the same immunity from illness. Four out of the seven find that they do not require "drink," and all are very abstemious.



A HOUSE AT WYNNEWOOD, NEAR PHILADELPHIA.

ELSEWHERE in this issue will be found an interesting and practical article on the subject of the erection of buildings to resist earthquake shocks, by Captain W. H. Bixby, Corps of Engineers, United States Army, who has had especial facilities for arriving at correct conclusions, being one of the Commissioners appointed by the Government to make examinations at Charleston and report upon the whole subject. It will be noted that the suggestions in the article are in much the same line as those made by observers in other earthquake countries, as noted in our issue of September 9.

NOTICE.

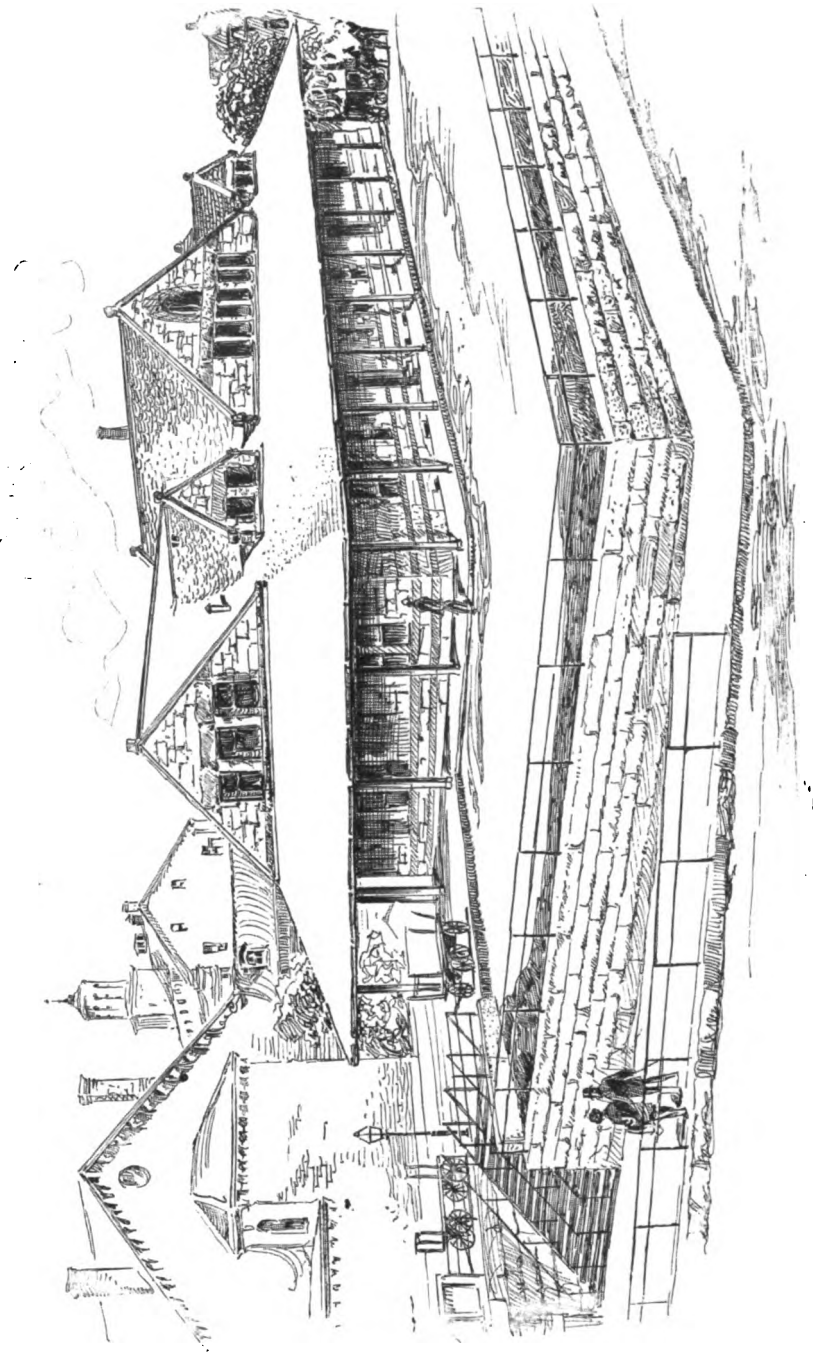
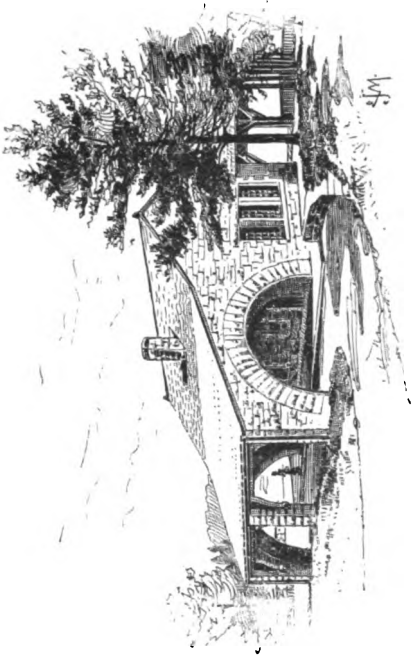
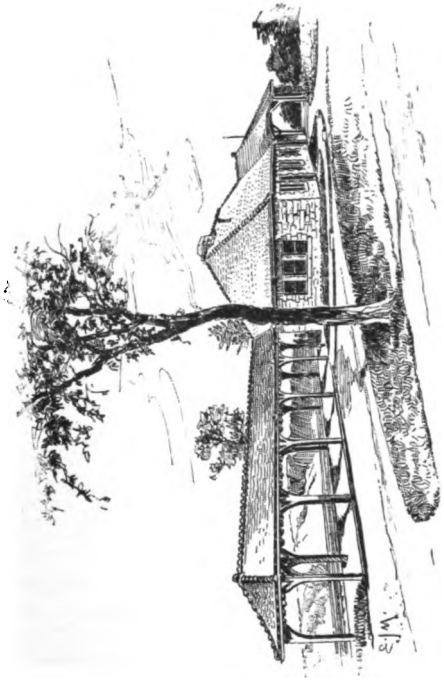
HEREAFTER the day of publication of THE SANITARY ENGINEER will be Saturday, instead of Thursday.

The latest application of glass is by Mr. F. Siemens, of Dresden, in the form of sleepers. A sample was recently tested at the Anderston Foundry Company, Glasgow. A rail was fixed upon a sleeper set in sand ballast in the usual way. A falling weight of $3\frac{3}{4}$ cwts., with an initiatory drop of six inches, rising by increments of six inches up to nine feet six inches, being the maximum elevation for the test-ram, was allowed to fall upon the rail without effect, until after the blow had been repeated six times at the greater elevation. It is stated that the cast-iron sleepers will withstand only to a 7-foot drop.

It is advisable to pay particular attention to the floors of business buildings where the merchandise is liable in any degree to pulverization or to produce dust. In conversation with the manager of one of our large tea-retailing firms he told me that owing to the depression in the ceiling below one of their sorting-rooms, on the floor of which the tea was shot by the ton, a new ceiling had to be put up, and it was then found that between the planking of the floor of the room and the composition of the ceiling there were several tons of tea-dust which had sifted through the cracks

Here is a new use for filth and sediment cleared out of the sewers. At a meeting of the Bermondsey vestry a few days since the Sanitary Inspector stated that he had discovered that the mortar used in the erection of several new houses now in course of construction in Long Lane is largely composed of sediment taken from the sewers, the builder having purchased this material from the contractor to the Metropolitan Board of Works. It appears that the contractor is bound to collect all soil, filth, or other matter of an offensive nature immediately after it is extracted from any trench, sewer, drain, cesspool, or other place, and carry it away to some objectionable place provided by himself. The Board of Works have no knowledge of the destination of this material, so long as no objection is raised by the residents of the neighborhood of the ultimate place of deposit, neither have they any authority in its ultimate disposal. The Sanitary Inspector very properly, under the authority of the Nuisances Removals Act, obtained the removal of material which was not used.

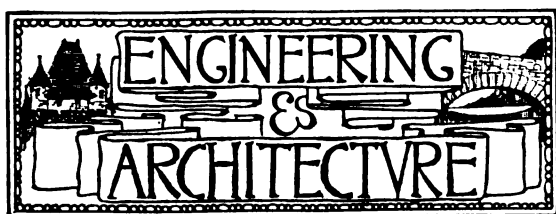
SAFETY-VALVE.



THE SANITARY ENGINEER ILLUSTRATED SERIES.

STATIONS ON THE BOSTON AND ALBANY AND CONNECTICUT RIVER RAILROADS.

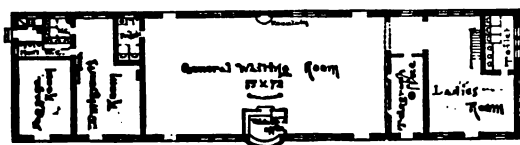
H. H. RICHARDSON, ARCHITECT.



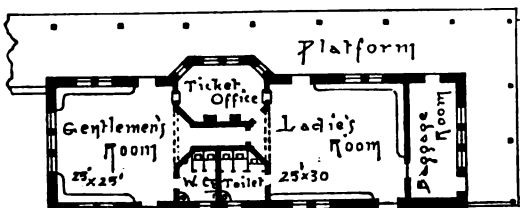
OUR SPECIAL ILLUSTRATION.

STATIONS ON THE BOSTON AND ALBANY AND CONNECTICUT RIVER RAILROADS.—THE LATE H. H. RICHARDSON, ARCHITECT.

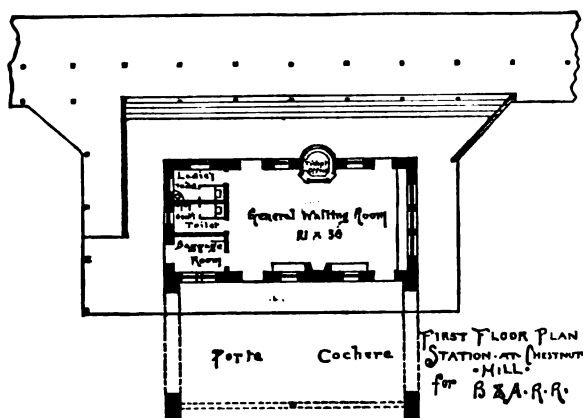
Of the two smaller cuts of our illustration the one to the left is a view of the station at Auburndale, that on the right the station at Chestnut Hill, both in the neighborhood of Boston, Mass. The former is on the main line, the latter on the Brookline branch line of the Boston and Albany Railroad.



FIRST FLOOR PLAN • HOLYOKE STATION • CONNECTICUT RIVER R.R.



FLOOR PLAN OF B & A.R.R. STATION • AUBURDALE



FIRST FLOOR PLAN STATION AT CHESTNUT HILL for B & A.R.R.

The larger cut shows the station at Holyoke, Mass., on the Connecticut River Railroad. All these stations are built of Braggville (Mass.) granite, with brownstone trimmings. The roofs are of red tiles, and the posts of the sheds and all the timber-work are of Georgia pine.

They were designed by the late H. H. Richardson, of Brookline, Mass.

OUR ILLUSTRATION OF A MODERATE-COST HOUSE.

A HOUSE NEAR PHILADELPHIA.

THE subject of our vignette illustration this week is a house at Wynnewood, near Philadelphia. We have been unable to ascertain the name of the architect, consequently can give no particulars.

A CORRESPONDENT writes: "The Committee on Public Buildings of Milwaukee, Wis., has received a petition from the Boss Carpenters' Association, asking that the Board of Public Works be instructed to advertise for separate bids on all public buildings. The rule now is to receive bids in the aggregate, leaving it with the contractor to sub-let, on his own responsibility, the carpenter, mason, and other department work. This rule is putting a premium on duplicity. The contractor would take the bids of the sub-contractors and show them to each other with a view of getting them still lower. The architects have adopted the plan of letting department contracts, and it has worked well."

SUGGESTIONS TO GOVERN THE ERECTION OF BUILDINGS, BASED ON THE EXPERIENCES OF THE CHARLESTON EARTHQUAKE.

BY W. H. BIXBY, CAPTAIN CORPS OF ENGINEERS, UNITED STATES ARMY.

At the request of various persons, I venture a few remarks upon the injury to buildings of the city of Charleston, S. C., by the recent earthquake, and upon various ways of lessening or obviating such injury in the future. These remarks are based upon the experience of a recent three-weeks' stay in Charleston and the inspection of several hundred buildings, this inspection having been authorized by the War Department at the request of the Mayor of the city.

Charleston possesses many buildings well constructed and built of good material, and, like all other cities, it also possesses many other buildings poorly constructed or built of poor materials. Some of the former buildings were severely injured in spite of their good construction and material; and some of the latter resisted the shock successfully in spite of bad construction and material. However, as a rule, the worst constructed buildings suffered the most severely, and in the most of the cases the error or weakness of their construction was easily learnt from a study of their ruins.

The greatest destruction of life, and perhaps also of property, was caused by the wholesale wreck of masonry and wooden porticos, heavy projecting cornices, heavy parapets, and tall chimney-tops on the outside of all buildings; by the breaking of chimneys and the overturning of the foundations of wooden buildings, and by the falling of unduly heavy and insecurely fastened plastering and stucco-work on the inside of all buildings.

Charleston contains many instances of masonry buildings which possessed heavy masonry porticos on one or more fronts of the building, these porticos consisting of an exterior row of stone or brick columns carrying lintels, a heavy ceiling, and a heavy superincumbent square-topped or gabled-topped mass of masonry, the lintels resting at their front end upon the tops of the piers and at their rear ends upon the front wall of the main building without being securely fastened to either.

Where the front of the portico has been parallel to the direction of the earthquake shock, the front portion of the portico appears to have continued its forward movement after the main building had commenced its return movement, and the portico has fallen either by the piers breaking or by the lintels turning obliquely and drawing off from their seats in the front wall of the main building. This rupture could probably be prevented by suitable horizontal oblique or diagonally crossed tie-rods connecting the front of the entablature to the front wall of the main building. When the front of the portico has been perpendicular to the direction of the shock, the front of the portico has at each successive shock been moved further and further from the main building until the lintels have drawn entirely off from their supports. This rupture could probably be prevented by the use of the before-mentioned diagonal tie-rods, or by other similar tie-rods placed along or through each lintel. In many cases broken lintels have proved that stone itself could not be depended upon to tie the portico to the rest of the building.

Wooden porticos were not usually injured except where their fronts were perpendicular to the direction of the shock and when they were not firmly tied to the building in their rear. When they fell, it was in the same general manner as that of the masonry porticos, and the remedy to be applied should in general be the same.

Heavy masonry cornices were in almost all cases severely damaged and partially or wholly thrown to the ground from all fronts of the building wherever used. Wherever cornices are necessary for the architectural effect, it seems to me that they should be made of wrought iron firmly secured to the adjoining portions of the building.

Heavy parapets, whose faces were parallel to the direction of the shock, were as a general rule comparatively uninjured, except by vertical cracks; but all heavy parapets whose faces were perpendicular to the line of the shock were as a rule broken off along the horizontal line of junction with the roof. Parapets if used at all should be firmly anchored to the neighboring roof. It would be better to make them of thin wrought iron instead of masonry, and still better to discontinue their use entirely.

Chimneys of the original construction reaching high above the roofs of the ordinary buildings were usually broken off

close to the roof. In some cases all the chimneys of a house fell inward toward the ridge-pole; in other cases they all fell outward; in still other cases they all fell toward the same point of the compass. These varied movements of the chimneys under the effect of the shock show that such chimneys should be firmly secured to the roof by both struts and ties, or by iron rods of large enough cross-section to sufficiently enable the rod to resist bending as well as tensile strains. In my own opinion, it would be better to end the chimney but little above the level of the roof, tying the chimney below the roof to the portions of the buildings through which it passes, and to extend the chimney above the roof by means of light tiles or chimney-pots, firmly secured to each other and to the roof by iron rods sufficiently strong to keep them from falling to the ground, in case they are blown over or shaken down. Such tiles would do but slight damage to the roof of their own or neighboring buildings, and there would also be comparatively little chance of their injuring foot-passengers. As it actually was in Charleston, the chimney-tops which fell inward usually crushed through the roof upon which they fell, and those which fell outward sometimes crushed through the roof and through the upper story of lower buildings upon which they fell; or falling upon a sidewalk crushed everything within their reach.

Tile, slate, and shingle roofs were badly wrecked by their own chimneys which fell upon them. As a rule, the metal-covered roofs suffered the least damage.

Flat segmental arches over doors and windows were almost invariably badly cracked at their springing lines. It would seem advisable to replace such flat arches either by full centre arches or by straight iron lintels having a solid and extended bearing on the neighboring masonry.

The outer walls of buildings, when perpendicular to the line of shock, were usually wholly or partially overturned along one of the horizontal joints of their masonry; in the majority of cases, the upper portion of the gable was alone broken out; in other cases the entire gable fell out; in a few cases the upper half of the entire wall fell down, and it was only in exceptional cases that the whole wall fell. The destruction of such walls could probably be entirely prevented by the judicious and sufficient use of ties and anchors connecting together the opposite walls of the building at its top and at the level of each floor, using at least one anchor to every pier between openings, at least one anchor to every eight feet of wall built without openings, and at least one anchor at the top of every gable; and also by arranging the windows and doors so that for horizontal stresses the walls shall be of equal strength along their horizontal course.

The outer walls of buildings, when parallel to the line of shock, were more or less completely split in a general vertical direction from top to bottom of the building, the cracks naturally joining the lower angles of openings of one story with the upper angle of the openings beneath them. In the majority of cases such walls appeared to the casual observer as completely wrecked, but most of them were thoroughly repaired by the replacement of the cracked portions of the wall directly above and below the windows and doors. In many cases these walls were readily repaired by a judicious use of rods and anchors. In all cases these walls should be securely anchored and tied in the same manner as walls lying perpendicular to the shock.

In many cases the tops of the outer walls of buildings were knocked outward by blows from the ends of the tie-beams of the roof. Such damage could be probably prevented, and the wall strengthened, by extending the roof's tie-beams entirely through or over the walls, and fastening these tie-beams to the exterior wooden or iron cornices in such way that the latter would serve as anchor-plates to hold the tops of the walls in.

In a few cases front walls of buildings were not cracked, but were bulged, so that the face of the wall midway between the angles of the buildings was forced outward a distance of from two to six inches. This bulging could be readily prevented by the proper use of anchors and ties.

In some cases of buildings used as shops, the show-windows of the lower story had been increased in size to such an extent that the piers between them were not sufficiently strong to hold up the front wall of the upper stories. Danger in such cases might be prevented by supporting the upper portions of the wall upon a single continuous iron lintel held up by iron piers resting on strong and solid foundations.

In some cases long narrow stores whose length was perpendicular to the shock had been built without transverse walls inside of their lower story; and the long walls under

the shock rotated about their junction with their foundations, and leaned so far that the whole building was in danger of falling. The most effective way of preventing such motion would undoubtedly be the use of transverse walls on the lower floor; but without doing this, the building could probably be made sufficiently strong by increasing the thickness of the walls of the lower story and adding strongly trussed transverse wooden or iron partitions between the walls of the upper stories.

In many cases poorly built but thick walls stood the shock better than well-constructed but thin walls, showing that a sufficient thickness of wall is almost as important as good material, good mortar, and good bond. In my opinion, buildings of Charleston, in view of the recent earthquake, should be restricted in height to three stories, and all front walls from top to bottom should be made a brick thicker than at present required by the city laws.

The worst ruined walls almost invariably showed their original weakness either in poorly made mortar, bad joints, or insecure bond.

Wooden buildings were seldom badly injured, except through weakness of their foundations or by the falling of their chimneys. In Summerville, where wooden buildings were most thoroughly wrecked, it has been customary to support these buildings upon brick piers. These piers, being about a brick and a half thick, two bricks and a half wide, and ten feet apart, are from six to eight feet in height. These piers are capped by wooden beams serving as the ground-sills of the house. The chimneys are usually placed at the ends of the building, are entirely disconnected from the building, and lie half outside of it. Under the earthquake shock, these chimneys either moved outward with their side of the building and fell down, or moved inward with their side of the building, broke in two and fell within the rooms; at the same time the whole building moved forward upon its foundation-piers, some of these piers broke or overturned, the building dropped upon the ground upon one of its lower edges, and not being constructed for strength against such a diagonal pressure, it was partially, if not entirely, wrecked. All danger to the inmates of the house, and probably much damage to the building, might be prevented by lowering the building to within one or two feet of the ground, by providing it with continuous and solid wall foundations (leaving only slight and occasional openings for ventilation), and by properly anchoring the chimneys to each other or to the rest of the house so as to make the chimneys and the rest of the building act as a single solid body.

On the inside of buildings the main damage appeared to be caused by falling plastering and stucco-work. In some cases the broken plastering showed that it had been originally from one to two inches thick, made of poor sand, without hair, and in some cases the broken stucco-work showed that it had been several inches thick, with nothing but its own cohesion to hold it up. In some cases the damaged ceilings showed wide strips of beams upon whose surface the plastering was obliged to cling without bond; in other cases, the laths for many feet were terminated on a single continuous line so that the vibration of the laths would necessarily break the plastering along this line. There seems to be no way in which plastering can be prevented from being broken under the effects of earthquake shock, but danger to the inmates of the building might be greatly prevented by attention to the material and bond of the plastering, and by using papier-mache as far as possible instead of stucco.

Buildings of mixed construction, whose walls were part wood and part brick, were always badly wrecked; the wood-work being broken and the brick-work thrown down. Such mixed construction should be avoided as far as possible.

Judging by the effect of the earthquake upon the heavy walls of the buildings, the effect must have been considerable upon the walls of the underground cisterns, on which almost every house in Charleston depends for its supply of drinking-water. I have no doubt that a great many of these cisterns have been cracked sufficiently to allow the entrance of the neighboring surface-water and soil-water. Water flowing over and through the soil of Charleston becomes so foul as to readily poison any pure water within its reach, and unless all the cisterns of the city are carefully examined and repaired there is great danger of much sickness from this cause during the coming year. It appears to me that cisterns in such low countries and saturated soils should be built entirely above the ground, being surrounded if necessary by an exterior wall and roof to allow ventilation and to protect the cistern from the heat of the sun.

THE TUNNEL UNDER THE RIVER MERSEY AT LIVERPOOL.*

No. II.

(Continued from page 442.)

OUR last article mentioned that cast-iron "tubbing" was used for lining the Liverpool shaft where the rock yielded much water. Figure 15 gives horizontal and vertical sections of the tubbing. The stiffening flanges are all on the convex side, and are about four inches high. No bolts were used, but the joints were made of red pine $2\frac{1}{2}$ inches wide and three-eighths of an inch thick, put in when all the tubing is in place, and wedged tight by driving in dry pine wedges. Oak dowels were driven into the spaces between the sections of the 18-inch wide cast rings or "cribs" at top and bottom of the sections of tubbing. At Birkenhead but a small portion of the shaft had to be tubbed. The space between the tubbing and the rock was not filled with earth, but, by advice of Mr. William Coulson, a 2-inch air-pipe was provided and carried up to above water-level, the object being to prevent an accumulation of gas behind the tubbing, as it had been stated to the author that gas so

CLOSE TOPPED TUBBING FOR 15 FT. DIA. SHAFT

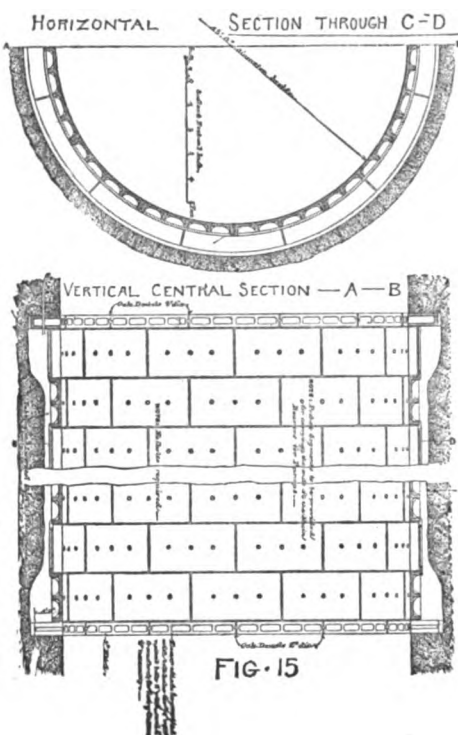
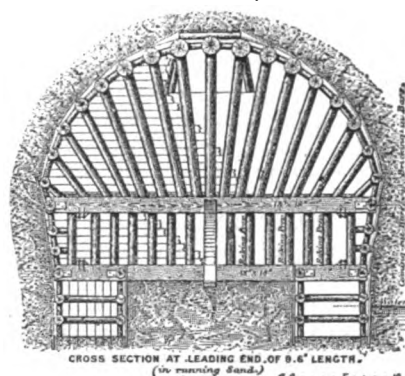
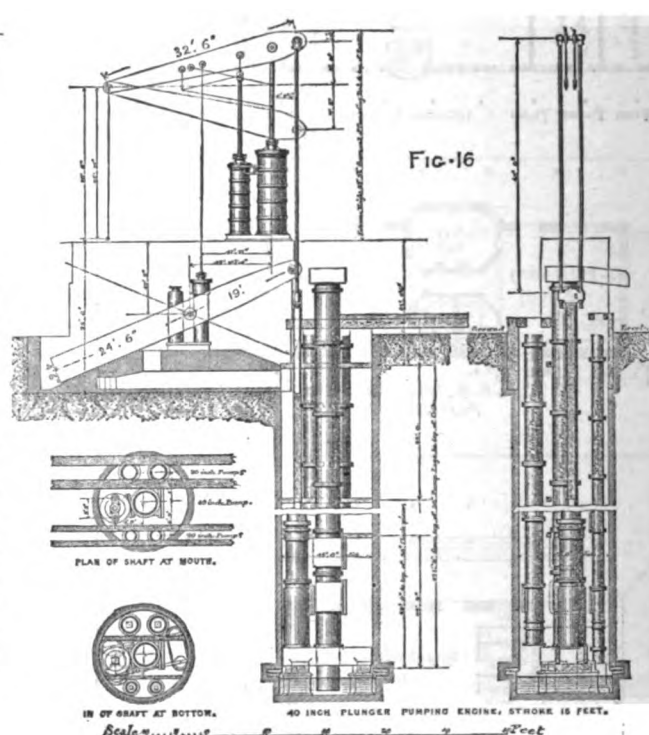


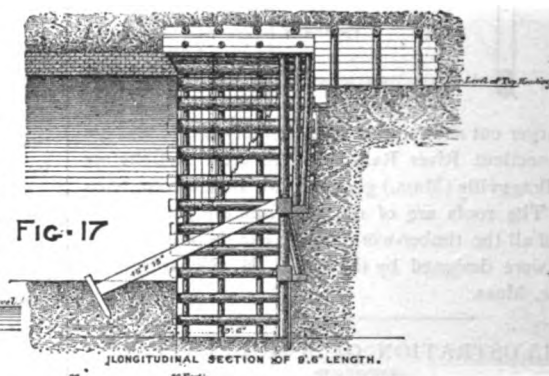
FIG. 15



CROSS SECTION AT LEADING END OF 9.6' LENGTH.



40 INCH PLUNGER PUMPING ENGINE, STROKE 15 FEET.



LONGITUDINAL SECTION OF 9.6' LENGTH.

penned up might have a pressure much greater than that due to the hydrostatic head.

The pumping machinery in Liverpool is shown in Fig. 16, and consists first of two pumps twenty inches in diameter, with 6 foot stroke, connected by means of quadrants to a compound engine manufactured by Messrs. Hathorn, Davy & Co., of Leeds. The low-pressure cylinder of this is thirty-five inches in diameter, and the high pressure twenty inches. By means of differential valve gear, the supply of steam is automatically adjusted to the work done, and it has saved the pumping machinery three times out of four when serious accident threatened it.

Next there are two 30-inch pumps driven by similar engines having cylinders of sixty inches and thirty-three inches diameter, respectively, with a 10-foot stroke. Lastly, there is a pump 40 inches diameter, and 15-foot

(which has but $1\frac{3}{4}$ inches lateral motion) and avoiding the wide swing it would receive if attached to the balance beam. As a result the pump has great smoothness of motion.

The pump-rod is of wood, having four malleable-iron plates at each joint. The rod is bolted to malleable iron forks having tapered ends turned and fitted, one end to the cross-head at top, and the other to the plunger at the bottom.

The pump is of the ordinary plunger pattern, and is turned true throughout its entire length, the working barrel being slightly larger than the plunger. The suction and delivery valves are of brass, mounted with strong steel lids having leather faces, malleable-iron guards, and fishing tackle. The clack-seats are provided with openings $4\frac{1}{2}$ feet by 3 feet 9 inches to allow of easy access to the valves, the doors to the openings being of steel. The whole pump is set on two massive cast-iron girders, the ends of which are placed on oak bedded in concrete, set on

* "The Mersey Railway," by Francis Fox, M. Inst. C. E.; and "The Hydraulic Passenger-Lifts at the Underground Stations of the Mersey Railway," by William Edmund Rich, M. Inst. C. E.

strong cast-iron boxes fixed below water-level at the bottom of the shaft, and on the solid rock.

The machinery at Birkenhead is similar, with the addition of a second pump like the last described, and arrangements are made so that all the water can be collected at either side of the water. The ample pumping power thus provided was in accordance with the strongly expressed opinion of Mr. Fox that there should always be large margin in such cases to allow for accidents and repairs.

Figure 17 shows the method of timbering adopted in the bad ground previously mentioned, where running sand was encountered.

One of the chief difficulties encountered throughout in building the brick-work was to keep it clear of the dripping water until the cement had set. This was accomplished by lining or roofing the top of the excavation in the tunnel with thin sheet-iron, or brattice-cloth. The work was very carefully done and the water led away to holes left near the invert. After the cement had thoroughly set the holes were plugged up. Much stress is laid upon the attention given to this detail as a cause of the great success achieved in making the tunnel dry.

Mr. W. Shelford made a critical examination of the sections at different points, showing that in Liverpool the haunches of the arches had been raised, while in Birkenhead they are circular, and suggested that the former were adopted to give more room for rolling stock. When railways were first built, tunnels on them were made tall and narrow to give space for smoke to accumulate and pass off, while now they were made wider and lower. For example, the Kilsby tunnel, built in 1837 on the London and Birmingham road, was $23\frac{1}{2}$ feet high and twenty-four feet wide, and the Sydenham tunnel, built in 1860 on the Chatham and Dover, was twenty-one feet high and twenty-four feet wide. Each of these gave much trouble. The Mersey tunnel was on the Liverpool side twenty-six feet wide and only nineteen feet high, and gave twenty-five feet width at ten feet six inches above the rails as now required by the Board of Trade.

The earlier practice was to make the tunnel an ellipse with its major axis vertical, as being better able to sustain top weight, but experience has since shown that the pressure was pretty uniform all round, as much strength was needed at the sides as the top, and the elliptical section described was very liable to give way.

The Sydenham tunnel mentioned was first constructed with the elliptical section by Mr. A. E. Baldwin. A tunnel in the same hill made under his superintendence two years later was of a semi-circular section, corresponding nearly to that of the Mersey tunnel.

The effect of the change of section was enormous, so much so that, whereas with the former section ten rings of brick-work were crushed, the section which was semi-circular stood well though only six rings thick. Not only was the latter form the stronger, but the saving in brick-work was very great, being nearly one-half of that required by the former.

Mr. Fox replied that the differences of section pointed out occurred only for a short distance where the tunnel had to be lowered, and one section was coned into another, otherwise the section was uniform throughout.

Mr. W. B. Lewis replied to Mr. Shelford, that he had omitted to mention the material in which the tunnels he instanced were constructed. In 1849 Mr. Lewis was engaged upon a tunnel in clay. It had a circular top, which it became necessary to raise a little, because, notwithstanding the great pressure all round, the top weight was found to be the greatest. It was a terrible place, and timbers were broken from below as well as from above. The Mersey tunnel being in rock, a good form to resist hydrostatic pressure was required, and one approaching a circle was best.

Mr. Shelford afterward explained that the tunnels mentioned were in the London clay.

The railway has steep gradients, a short length of one in twenty-seven, and considerable lengths of one in thirty, with curves of 528 feet and 594 feet radius on the main line. The rails are of the bull-head section, weighing eighty-six pounds per yard, with deep fish-plates, and fixed in chairs weighing fifty-four pounds each. The rails are upon wooden cushions recessed into the chairs, and two thicknesses of felt are placed under each chair in accordance with the requirements of the municipal authorities. There are thirteen creosoted sleepers ten feet long by five inches deep to each thirty feet of track. The ballast is of sandstone rock from the tunnel, hand-packed to within four

inches of the bottom of the sleeper, covered with four inches of broken sandstone rock, with a 6-inch top covering of dry clinker-ashes.

The works are lighted by gas, the reason being that as a result of competition (in which arc-lights were excluded as being objectionable in an underground railway), the first cost of the installation of the electric-light would have been five times that for gas, and the annual cost three times as great. Gas is supplied by a 4-inch gas-main connected with gas-mains on both sides of the river. All waste of gas is prevented by automatic governors fixed inside each burner, and no deficiency in pressure had been experienced.

The line is worked by locomotives of about seventy-four net tons weight. They are six-wheeled, coupled tank-engines, with a four-wheeled bogie, making ten wheels in all, and have inside cylinders twenty-one inches in diameter by 26-inch stroke. The cars are twenty-seven feet long and eight feet wide, and have a wheel-base of $15\frac{1}{2}$ feet.

Both engines and cars are fitted with the automatic vacuum brake, and the locomotives have also a powerful steam-brake on them.

Mr. B. Baker considered the dipping gradients between stations very favorable to the working of the line. In some experiments on the Underground Railway he found that on a level line with half-mile stops and thirty-six pounds of fuel per train-mile burnt by the engine, about fifteen pounds were utilized in overcoming the frictional resistance, and twenty-one pounds, or over sixty per cent. of the whole, were expended in getting up speed, and by the brakes in pulling up.

In the present case there was a smart falling gradient to get up the speed, and a rising gradient to stop the train, and he thought but about half the quantity of coal would be required, and there would be but half the fouling of the air that was experienced on the Underground.

As a matter of fact, the trains run from station to station in $3\frac{1}{2}$ minutes, and allowing $1\frac{1}{2}$ minutes for descending by the hydraulic lifts at one end, and the same for ascending at the other, the time occupied in passing from the heart of one city to that of the other is $6\frac{1}{2}$ minutes, which is a saving of about fifteen minutes' time over the passage by the ferries.

(TO BE CONTINUED.)

ROCKFORD, ILL., WATER-WORKS.

FROM the report of the superintendent for the year ending April 25, 1886, it appears that a part of the supply is drawn from two artesian wells, respectively 1,520 and 190 feet deep, 325 feet from each other. The combined flow from these wells is 2,022,000 gallons in 24 hours. A river furnishes supply when there is excessive draught on the mains in case of a fire.

The supply is pumped (presumably directly into the mains) by a Holly and a Gaskill steam pump.

The length of the distributing mains is not given, nor the number of taps. It is stated, however, that there are 1,219 individual accounts for water-rates. There are 151 stop-cocks on the mains, and 223 fire hydrants. The daily average quantity of water supplied is 1,287,285 gallons, for pumping which there were consumed 1,482,747 pounds of coal, costing \$1,457.58. The wages of attendants and miscellaneous supplies brought the cost of pumping up to \$5,062.44. The average head on the pumps is stated to be 125 feet, which makes the cost of raising one million gallons one foot 2.3 cents.

There was expended on construction of wells, etc., during the year, \$18,495.91, making total cost to date \$324,538, all of which has been paid out of taxation and revenue of the works, except bonds to the amount of \$94,000 outstanding. The rate of interest on them is not given.

The revenue from water-rates for the year was \$12,936.75, and the expenses for maintenance and repairs amounted to \$9,207, so that the works seem to be nearly self-sustaining, if the interest account is taken into consideration.

As nothing is said about meters, there are probably none in use. This may account for the enormous waste of water, the consumption being 1,056 gallons daily to each tap. This is a good deal more than it ought to be, although it is less than the rate of a good many towns which pump direct.

The ratio between expenses and receipts is not very fairly proportioned. The consumers ought not to pay the entire expense, as a considerable quantity of water is used for

public purposes, and that ought to be assessed on property at large. In this case, the rate of interest on the bonds being 5 per cent. (as obtained from other sources, though not mentioned in the report), the total expenses, including interest, amount to only \$970 more than the amount paid by water-takers. This is only \$4 per annum per fire-hydrant. When works are owned by a private company, the usual rate charged the town is about \$50 per hydrant. However, in this case, it appears that the town has paid \$223,575.62 out of taxation for the works in ten years. It seems proper after all that now the hydrant rate should be reduced. It would probably have been more equitable to have distributed the taxation over a longer period.

This report contains most of the items desirable in such a document, but so arranged that it takes considerable labor to find out anything that is wanted. If the superintendent had followed the form set forth by the American Water-Works Association in the arrangement of his statistics, it would have simplified the work of comparison with other water-works.

SHORT ROOFS AND HALF-TIMBERED GABLES AGAIN.

NEW YORK, October 8, 1886.

SIR: When a man looks over the fence into the fair fields of a neighboring profession, an *ex cathedra* reply to any criticisms should be expected.

American houses are very comfortable in cold weather, but no provision has been made for refrigerating them in hot weather, except closing them shortly after sunrise, which is not believed to be a strictly American invention. The almost universal practice of our forefathers was to face the short roof toward the south; this may or may not be reliable testimony as to the purpose of the proceeding.

Canterbury is the only city in which the writer paid any particular attention to old buildings. There I was shown some half-timbered houses, which my guide, a very intelligent young engineer, told me were among the oldest in England, and on my mentioning that the timbers in the gables were flattened branches, he said their use was common, and that even now, on account of the high cost of timber and the absence of saw-mills, the use of flattened branches and tops was common for cheap buildings in the country. After that the same use of branches was noticed in some gables in London. Now, if my informant and myself were really wrong historically, I would like to be set right by the citation of examples.

But constructionally, "Architect" should revise his opinion if the timbers were intended to represent supports to the roof, and they have that appearance to me, for neither an ogee nor any other curve should be admitted in a strut.

CIVIL ENGINEER.

AMERICAN SOCIETY OF CIVIL ENGINEERS.

THE regular semi-monthly meeting of the American Society of Civil Engineers was held on the 6th inst. The following gentlemen were elected to membership in the grades mentioned:

For Members.—Samuel George Artinistall, City Engineer, Chicago, Ill.; George Birdsall Cornell, Chief Engineer Brooklyn Elevated Railway; Benjamin Lincoln Crosby, Resident Engineer Rulo Bridge, Rulo, Neb.; James Gustavus Dagron, Chief Inspector of Bridges, Baltimore and Ohio Railroad, Pittsburg, Pa.; Stephenson Waters Fox, U. S. Assistant Engineer, Improvement Works of the Missouri River, St. Joseph, Mo.; Frederick William Doane Holbrook, Superintendent Yellowstone Division Northern Pacific Railroad, Glendive, Mont.; George Anthony Lederle, Resident Engineer Omaha Bridge, Omaha, Neb.; Leonor Fresnel Loree, Chicago, St. Louis, and Pittsburg Railroad, Logansport, Ind.; Sampson Douglas Mason, Principal Assistant Engineer Northern Pacific Railroad, St. Paul, Minn.; Robert John McClure, Consulting Engineer Chicago, Burlington, and Quincy Railroad, Denver, Col.; James Henry Morley, President of the Mary Murphy Mining Company, St. Louis, Mo.; Thomas O'Neill Morris, Engineer Maintenance of Way, Cincinnati, Indianapolis, St. Louis, and Chicago Railway; Henry Cuyler Parsons, Engineer in the Department of the State Engineer, Albany, N. Y.; Alfred Petry, Assistant Engineer Kentucky Central Railroad, Covington, Ky.; Hugh Tudor Richards, Resident Engineer Sonora Railroad, Guaymas, Sonora, Mexico; Francis Morris Rutherford, Assistant Supervisor Amboy Division Pennsylvania Railroad, Bordentown, N. J.; John Henderson Sample, Chief Engineer for W. V. McCracken & Co., Kansas City; Julius William Schaub, Engineer in Charge Dominion Bridge Company, Montreal, Can.; Richard Willette Sherman, City Surveyor of Utica, N. Y.; Miller Armstrong Smith, Brooklyn, N. Y.; John Frothingham Ward, Consulting Engineer, New York City.

For Associates.—Frank W. Handy, Architect and Superintendent of Construction, Cincinnati, O.; Robert Cochran McKinney, Secretary and Assistant Manager Niles Tool-Works, and the Gordon and Maxwell Company, Hamilton, O.

For Juniors.—Edward Marshall Boggs, Colorado Midland Railway, Colorado Springs, Col.; Francis Denis Hubert Lawler, Engineer Iowa lines Chicago, Burlington, and Quincy Railroad, Burlington Iowa.

The first paper of the evening was by A. D. Foote, M. Am. Soc. C. E., on a "Water-Meter for Irrigation." As we propose to print the paper in our next issue we will not mention it further now.

Mr. Dorsey exhibited a drawing of a rolling-gate to be used as a head-gate to irrigating-ditches. The gate is composed of 8x8-inch timbers connected by hinges, and rolled up on an iron roller by means of two wire ropes passed underneath. After a brief discussion, the second paper on "Excessive Rainfalls," by S. Whinery, M. Am. Soc. C. E., was read. The details were interesting, and the author proposed as a *resume* of the whole, the following formula :

$$r = \frac{R}{12}$$

Where r = the inches of maximum rainfall to be expected in any one hour ;

And R = the mean annual rainfall in inches at the place.

The formula was criticized as being unsafe, and probably not true, except in selected cases, there being really no natural connection between the two quantities.

Mr. Brush stated that at Patterson 11 inches had fallen in 24 hours, but in no case had more than two inches fallen in any one hour.

THE ARCHITECTURAL LEAGUE OF NEW YORK.

THE first regular meeting after the summer vacation was held Tuesday, October 5, at Martinelli's restaurant, many of the members dining together previous to the meeting as usual. The Committee on Current Work were empowered to make arrangements with the Salmagundi Club for a joint exhibition to take place next January. Mr. H. L. Warren resigned from the committee on account of removal to Boston, and Mr. John Dufais was elected to fill the vacancy so caused. The committee now stands as follows : Mr. F. A. Wright, chairman ; Mr. J. D. Hunter and Mr. John Dufais. A number of new members were elected, including Mr. A. T. Bloor, Mr. A. H. Thorp, and Mr. Bruce Price.

WASHING FILTER-SAND.

THE water-works at the Tezel Lake, near Berlin, for the supply of that city, use their filter-sand over and over again by washing it in a revolving tapering drum with a flange in the form of a screw-thread on the inside, provided with plate-iron lugs at intervals to still further break up the movement of the sand. The inside of the drum is also set with lance-points. The sand enters at the large end, and the washing-water at the other. The water-level is maintained constant in the drum by annular heads, leaving part of the central area of the end open. The consequence of this arrangement is that the dirty sand meets the dirtiest water first, is moved along by the screw flange, and, finally, at the small end of the drum is lifted by buckets riveted to the end and tipped into a trough projecting into the drum above the axis. By this it is thrown upon an inclined plane set with projecting flanges, which give it a diagonal motion, and receives its final washing by a water-jet which washes it into a trough from which it is removed to the place of storage for future use. The machine is run by a six-horse-power engine and washes about 3.9 cubic yards per hour at seven revolutions of the drum, which is about eleven feet long by four feet nine inches diameter at large end by three feet six inches at small end. The operation requires, according to *Glaser's Annalen*, ten to eleven litres of water per cubic metre. This must be an error for hectolitres, which would make about 230 gallons per cubic yard. The gross cost of the operation, including all expenses of transport to and from the machine, are twenty-five cents a cubic yard. The apparatus will be found illustrated in detail in *Glaser's Annalen* for the 15th of August, 1886.

RUTTER'S FORMULA AND ITS APPLICATION TO CIRCULAR SEWERS.*

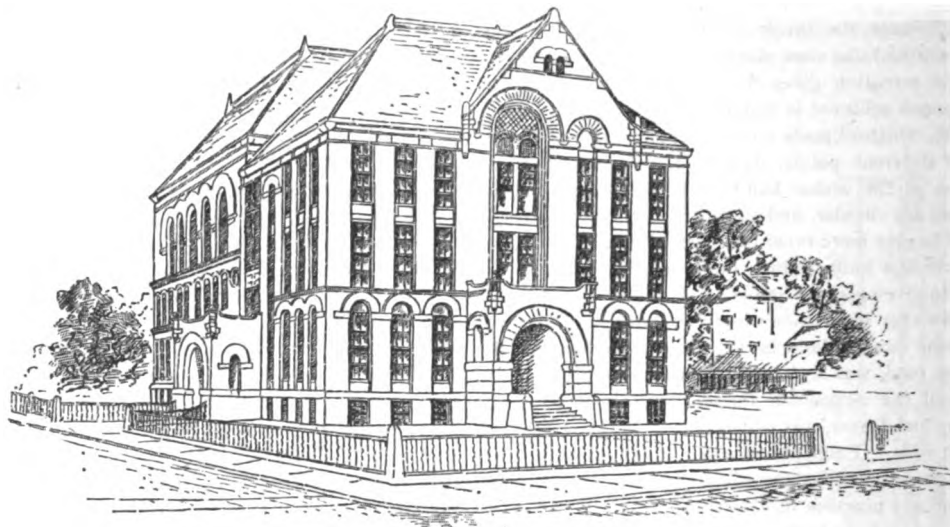
THIS is a valuable paper, illustrated by curves showing the various applications of the formula (compared also with the revised Weisbach formula), and one especially giving the curves of maximum discharge in circular sewers, the authors holding that this is the best basis of comparison. There is, also, a table giving diameters for maximum discharges under different grades of relative velocity and relative discharge under different depths in a circular sewer, etc. The paper will be very useful to practical men.

* By Robert Moore and Julius Baier, members of the Engineers' Club of St. Louis. From journal of the Association of Engineering Societies, August, 1886.



HEATING AND VENTILATION OF A GRAMMAR SCHOOL.

THE Dudley Street Grammar School-house, Boston, now being built from the plans of City Architect Arthur H. Vinal, is a 14-room school-house, with an exhibition-hall seating about 1,000 persons. Mr. Vinal considers this one of the best arranged school-houses in the city, and a description of the main features of the building may prove of interest.



O'Brien Grammar School House.
Dudley Street Boston Highlands.
A. H. Vinal City Architect.

Our illustrations represent the basement, first and third floor plans, and a perspective sketch. The second floor is essentially the same as the first, the only difference being that over the front hall is a master's room, with toilet arrangements. As can be seen, there are six school-rooms

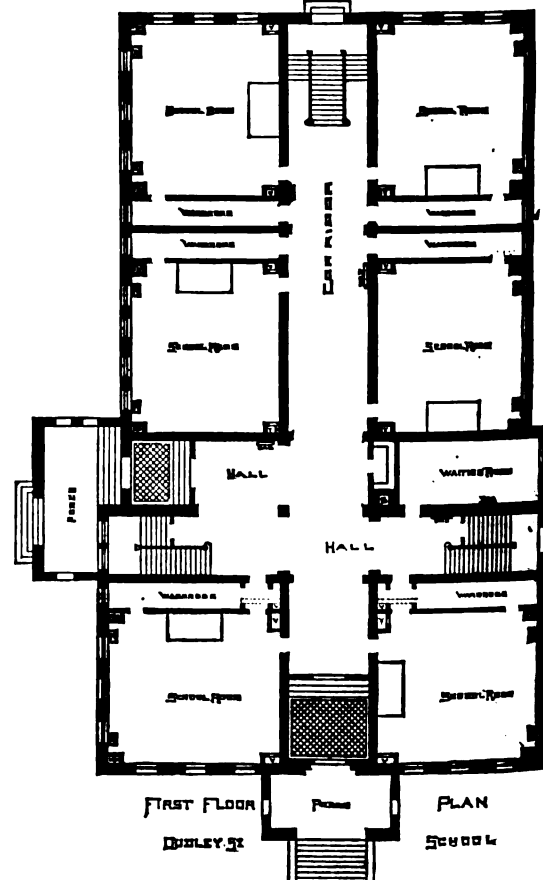
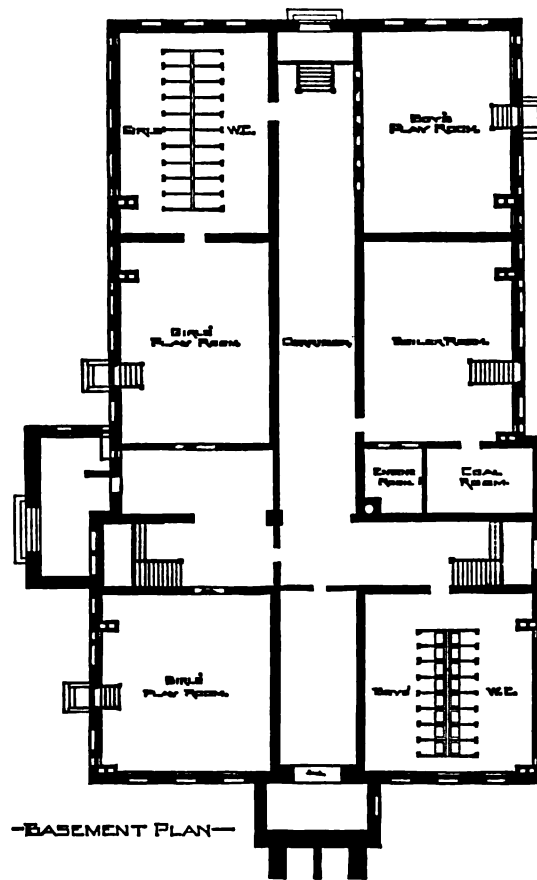
titions are of brick, and all furring and wooden partitions are fire-stopped with brick and mortar, so that the building may be classed under the head of "slow-burning construction." The basement is devoted to play-rooms, toilet-rooms, furnace and coal rooms. The basement floor is only four feet below the surface of the ground, and the basement is nearly as well lighted as the stories above, and, presumably, equally as dry. All the partitions come over each other, so that the construction is very simple, less walls being carried on iron beams than is usually the case in school-houses of this size.

HEATING.

The heating plant consists of two 48"x16' tubular boilers, containing forty-nine 3-inch tubes fifteen feet long, located in the basement.

Each school-room is warmed by two stacks of indirect radiators, each stack containing 150 feet of heating-sur-

face, and the exhibition-hall by twelve stacks of indirect radiators, containing 140 feet of heating-surface each, all located in the basement, and 800 feet of direct-radiating surface, placed in the hall where indicated on the plans, and marked "RAD."



on each floor, all well lighted, the four corner ones having left and rear light, while the two centre ones have left light only, and all reached by wide corridors and stairways. There are no dark or half-lighted corridors in the building. The stairs are of iron, with oak treads. All the main par-

The hot air passes from the indirect radiators to the school-rooms through 12"x16" brick flues lined with tin and marked H on the plans, the hot-air register being located on the outer sides of the rooms near the flues and marked R, while the ventilating-registers are on the inner sides of the

CONTRACTING INTELLIGENCE SUPPLEMENT

OF

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DEVOTED TO

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VOLUME 14.]

NEW YORK, OCTOBER 14, 1886.

[NUMBER 20.]

For Proposals, see pages, . . . 462-473

For other Contracting Intelligence,
see pages, . . . 473-480

CONTRACTING INTELLIGENCE.

(Continued from page 473.)

PHILADELPHIA, PA.—A petition is before City Councils asking for the construction of a \$50,000 sewer along Wingohocking Creek.

The newly-chartered Metropolitan Railway Company of Philadelphia, William A. Ingham, President, has applied to councils for authority to build a system of underground railways. The application has been referred to the Railroad Committee.

BALTIMORE, MD.—The State Library Committee of the Board of Public Works will receive proposals until October 21 for the enlargement of the State House at Annapolis. The architect is Jackson C. Gott, Charles and Fayette Streets, Baltimore, Md. Bids should be addressed to J. Shaaf Stockett, secretary of the committee, at the State House.

EXTENSIVE LEVEE WORK.—Bids for constructing rather more than 1,000,000 cubic yards of levees in the Fifth Louisiana Levee District will be received by the Board of Levee Commissioners until October 18. Separate bids for each locality must be submitted. Information can be obtained from the Board of State Engineers, New Orleans, La. The President of the Board of Commissioners is George C. Waddell, Delta, Madison Parish, La.

JACKSONVILLE, FLA.—The Sanitary Trustees have just made a report in which the extension of the sewerage system is pointed out to be a necessity.

OSHKOSH, WIS.—Senator Sawyer will build a \$100,000 library building here and present it to the city.

CHICAGO, ILL.—General Joseph Stockton, of the Park Commission, has under consideration a plan for constructing a viaduct from the Rush Street bridge on Front Street and Central Avenue to Randolph Street.

PALATKA, FLA.—The gas company is trebling the capacity of its works.

MILWAUKEE, WIS.—The Board of Public Works opened bids October 5, for the erection of a water-tower at the corner of North Avenue and Eleventh Street, as follows: G. F. Stuewe, \$31,750; and Fred. C. Kraatz, \$29,922. The figures were too high, and the work will be readvertised. Bids were also opened for completing the erection of a wrought-steel stand-pipe for the high-service pumping-works, corner of North Avenue and Eleventh Street. The bidders were: J. F. Weinhausen, \$8,400; Richard Davis, \$10,300; and W. H. Keepers, \$11,447. The matter of awarding the contract was laid over for a future meeting.

BEAVER, PA.—Engineer Jacob Schneller, of Pittsburgh, has begun building water-works here.

BROOKLYN, N. Y.—The Board of Directors of the Elevated Railroad has approved plans for making a new connection between the elevated structure and the bridge on Washington Street.

ELMIRA, N. Y.—Proposals are wanted by John B. Stanchfield, Mayor of Elmira, until Oct. 18, for constructing a stone bulkhead with automatic gate, at the outlet of a main sewer in the town of Southport.

ST. PAUL, MINN.—Architect E. P. Bassford estimates the cost of finishing the court house, including elevators, plate-glass, marble wainscoting, electric light plant—everything except furniture—at \$315,148. This is not based on bids received, but on estimates.

The contract for the Stock Exchange at the stock-yards in West St. Paul has been let to G. J. Grant for \$35,000. The building will be 100x60 feet, three stories high. The contract for two ice-houses in the same locality has been let to Hennessy Bros., Agnew & Cox for \$28,000. A packing-house is to be erected also at a cost of \$100,000, and an elevator at about \$10,000.

CREMATORY PROPOSED.—The Cremation Cemetery Company of Baltimore, Benjamin F. Horwitz, President, will build a crematorium, with chapel, furnace, etc.

ST. PAUL, MINN.—The State Board of Regents has rejected the plans proposed for the new Science Hall, as being too expensive. The matter will be reported on by a special committee, November 23.

HUDSON RIVER BRIDGE.—Surveys for the Storm King Bridge over the Hudson River are in charge of Chief Engineer William V. Smith, and Assistant Engineer Bryson, of the Phoenix Bridge Company, of Philadelphia.

LOWELL, MASS.—The resolution introduced in Common Council to raise a loan of \$25,000 for the sewer department, was defeated last week by a strict party vote, Republicans voting against it.

WINNIPEG.—Associated Press dispatches state that Hugh Southerland, President of the Hudson Bay Railway Company, has completed arrangements in England for building the entire line. Work will begin on Thursday, October 7, with the intention of finishing forty to sixty miles this season. Sub-contracts were let October 4 for a large part of the road, and the contractors are telegraphing for engineers and laborers.

TOPEKA, KAN.—A dispatch to the *Sun* states that the Chicago, Kansas and Western Railway (Atchison, Topeka and Santa Fe) October 9 filed an amended charter with the Secretary of State by which they are to build and operate fifty-two lines in the State of Kansas, and have fixed their capital stock at \$154,000,000, thus making their capital stock larger than any railroad company's. The headquarters of the company are at Topeka. The directors of this new company are: Joab Mulvane, P. I. Bonebrake, J. P. Griswold, John R. Mulvane, and J. F. Parmlee, of Topeka; D. M. Finney, of Neosho Falls; I. A. Burdette, H. S. Burdette, D. L. Dallup, E. W. Kinsley, A. W. Luke, J. F. McKien, and E. I. Thomas, of Boston. The combined length of the proposed lines is 7,274 miles.

INDIANAPOLIS, IND.—Sealed proposals will be received until November 1, for the construction of the Union Passenger Station in the city of Indianapolis, Indiana. The main building will be 150 feet square, three stories high, with tower. The two baggage buildings will be 25x150 feet, two stories high. Train shed will be 180x750 feet. The buildings will be of granite, pressed brick and stone. The train shed will be of iron. Plans and specifications of the buildings may be seen after October 11, at the office of the undersigned, in the Indiana National Bank Building, Washington Street, Indianapolis, and at the office of the president, in the Pennsylvania Company's building, Pittsburgh, Pa. Contractors should address bids to

V. T. Malott, Vice-President and Manager of the Indianapolis Union Railway Company, at the above address.

SHARON, O., has a newly organized Natural Gas Company, David O. Day, of Buffalo, a principal director, which proposes to build pipe-lines for the supply of natural gas to Sharon and several other towns.

THE recently organized Cremation Society of Milwaukee met at Bader's Hall October 5 to complete its organization. Mr. A. Meinecke and others were appointed to collect dues, which are \$2 for the first year and \$1 for each succeeding year; \$25 will secure a life membership. Five thousand copies of the constitution will be printed.

THE Chicago, Cairo and Great Southern Railroad Co. has lately reorganized under the same name with a view to building a railroad from Chicago to Cairo. The incorporators are Edgar D. Swift, Altee V. Coule, George W. Waite, Arthur F. Williams, Charles W. Stobie, all of Chicago.

THE North Chicago Railway Co. will build a cable road.

THE Brooklyn Aldermen have granted to the Prospect Park and Coney Island Railroad Co. the right to construct a cable road on Park Avenue and other streets.

A HORSE railroad will be built from Long Island City to Flushing Bay, by the Riker's Avenue and Sanford's Point Railway Company. Among the incorporators are: William and George A. Steinway, Emil Rothgeber, and Oscar R. Steins.

THE Union Pacific Railway office at Omaha, Neb., will receive bids until October 19, for grading, bridging, and track-laying of the line from Loveland to the Buck Horn Stone Quarries in Colorado, about 8½ miles, and the extension of the Salina, Lincoln & Western Railway from Lincoln Centre westward, in Kansas, 40 to 50 miles. S. R. Callaway is General Manager.

THE Annapolis and Baltimore Short Line Railroad Company wants proposals, until Oct. 16, for the construction of a depot, freight sheds, engine-house and machine-shops at Annapolis. Address, H. P. Underhill, President, 6 South Street, Baltimore.

VICKSBURG, MISS.—The newly organized Vicksburg Water-Works Company laid a proposition before Mayor and Council October 11, agreeing to furnish the city 100 hydrants, with water for all city purposes, for an annual rental of \$70,500, the company binding itself to have its water-works completed and in perfect operation within eighteen months from the date of contract. Action on the proposition was deferred.

LOW-PRESSURE STEAM-APPARATUS.—H. W. Austin, Custodian of the United States Marine Hospital at Chelsea, Mass., will receive proposals until October 23, for a low-pressure steam-heating apparatus, etc.

OTTAWA, CAN.—Proposals for constructing a wharf at Longueuil, Que., will be received by A. Goleit, Secretary of Department of Public Works, Ottawa, until October 22.

SAVANNAH, GEO.—Builders are informed that bids will be received until November 15, for constructing a large brick hotel at Savannah. J. A. Wood, 76 Chambers Street, New York City, is the architect.

PITTSBURG, PA.—The Pennsylvania Construction Co. has just received a contract at \$3,300 for the iron-work of the Sisters of Mercy Hospital.

MINNEAPOLIS.—The Commissioners of Hennepin County, Auditor's office in this city, will receive bids until November 1, for building a bridge, 180'x16', across Shaver's Narrows, Lake Minnetonka.

RAILROAD.—James H. Bullard, secretary and general manager, at Pacific Junction, Ia., will receive bids for constructing the Chicago, St. Louis & Pacific Railroad. Address him for particulars.

THOMASVILLE, GEO.—H. W. Hopkins, Mayor, will receive bids until November 1, for boring and tubing a well about 500 feet deep.

GLOVERSVILLE, N. Y.—The Village Trustees are making arrangements to obtain a supply of water from Jackson's Summit.

BALTIMORE, MD.—It is reported here that President Garrett of the Baltimore & Ohio Railroad has arranged for the extension of the Shenandoah Valley Railroad to Pensacola, Fla.

We have noted that a project was under discussion in the City Council for a \$1,000,000 improvement to Patterson Park, sewerage, etc. The ordinance was defeated last week.

UNIONTOWN, PA.—The Pennsylvania Construction Co., of Pittsburgh, has received a contract at \$12,000 for the iron-work, from the Columbia Steel and Iron Co.

ALBANY, N. Y.—Work on the Patroon Creek sewer not being satisfactory to the Board of Contract and Apportionment, W. J. McCann, contractor, has agreed to do it over again.

DANVILLE, ILL.—Col. George E. Waring, Jr., is employed to make a report of sewers. Town Committee have recommended the City Council to adopt the system. Sub-committee has been appointed to procure estimates of cost. For particulars address Dr. William I. Moore, J. B. Mans, and J. P. Cannon.

PHILADELPHIA, PA., October 8.—Proposals were opened at the office of the United States Engineers in this city, for furnishing and placing stone in the gap at the Delaware Breakwater, and the following were received: William M. Field, of Kentmere, Del., \$2.10 per ton; James Andrews & Solon T. Andrews, of Biddeford, Me., \$2.45; Daniel V. Howell, of New York, \$3.27; John A. Bouker, New York, \$2.11; John Satterlee, Englewood, N. J., \$2.13¼. Field being the lowest bidder received the contract.

A contract has been awarded to the Holly Manufacturing Company, of Lockport, N. Y., by the Water Committee of Councils for the construction of a 20,000,000-gallon a day pumping-engine for the Spring Garden Works. The bids were opened on June 15 and referred for consideration. They were as follows (with the guarantees of "duty" and quantity of coal required to pump the 20,000,000 gallons daily for a year): H. R. Worthington, of New York, \$57,000, duty 105,000,000, coal 4,913 tons; Robert Wetherill & Co., of Chester, \$67,000, duty 105,000,000, coal 4,913 tons; Holly Manufacturing Company, of Lockport, N. Y., \$60,000, duty 110,000,000, coal 4,690 tons; William Cramp & Son, Philadelphia, \$72,330; duty 100,000,000; coal 5,157 tons; I. P. Morris & Co., of Philadelphia,

phia, \$87,000, duty 100,000,000, coal 5,157 tons.

(Above bids were printed in THE SANITARY ENGINEER, June 17, 1886.)

KENT, O.—The following bids for furnishing about 650 tons of cast-iron water pipe and 20 tons of special castings were received by A. N. Martin, President of Kent Water Company, September 18:

BIDDERS.		Delivery.					
		12-inch.	10-inch.	8-inch.	6-inch.	4-inch.	Specials.
Barrows & Co., New York.....	29.50	30.00	30.50	31.00	31.50	32.00	2½c.
Buffalo Pipe Co., Buffalo, N. Y.	31.00	31.00	31.24	31.59	31.84	32.00	2½c.
Chin. and Newport Iron and Pipe Co., Newport, Ky....	33.50	33.50	33.50	33.50	33.50	33.50	7c.
A. H. McNeal Co., Burlington, N. J.	34.00	34.00	35.00	35.00	35.00	37.00	2¾c.
Dennis Long & Co., Louisville, Ky.....	35.84	35.84	35.84	35.84	35.84	35.84	3½c.
Ohio Pipe and Foundry Co., Columbus, O.	36.40	36.40	36.40	36.40	36.40	36.40	3¾c.
Jackson & Woodin, Berwick, Pa.....	37.00	37.00	38.00	38.00	38.00	39.00	3c.
							Nov., Dec., Jan.
							Oct. and Nov.
							Nov. to Dec. 15.
							" "
							" "
							Jan., Feb., March.
							Oct. 15, Dec. 25.
							Nov. to Jan. 1.

CHICAGO, ILL.—This city has awarded the contract for cast-iron pipe, to be delivered here, to the Cincinnati and Newport Iron and Pipe Co., the total consideration being some \$30,000: 1,000 lengths of 6-inch pipe at \$28.97 per ton; 2,000 lengths of 8-inch pipe at same price, and 250 lengths of 12-inch pipe at same price. Competing bids were: Buffalo Cast-Iron Pipe Co., \$29.50 per ton, right through; McNeal Pipe and Foundry Co., \$35.50 per ton; Ohio Pipe Co., \$31; Dennis Long & Co., \$32; Gloucester Iron-Works, \$35.91 for the first two sizes, and \$34.39 for the largest pipe.

The Board of Government Engineers, which met in Chicago October 4 to discuss the Hennepin Canal project, will report to the U. S. Government in November. The board is composed of Gen. C. B. Comstock, Col. O. M. Poe, and Major J. C. Post.

A large work will be done here, in the way of constructing dry-dock plant, by the Lake Superior Dry-Dock Company—President, John Fitzgerald; Secretary, John Keith. The location of the dry-dock is to be decided on this week or next.

MILWAUKEE, WIS.—A correspondent writes that unless the city should take steps before long to provide for a new intake a water famine will, no doubt, be experienced here. It is urged that bonds should be issued at once and work begun, as the need is imperative. The pumping facilities are ample, but the water cannot be secured through the present intake, and one engine has to lie idle. The City Engineer favors the issuing of bonds to the amount of \$400,000 to pay for the new intake.

TORONTO, ONT.—The contract for the masonry of the new Parliament buildings has been let to Lionel Yorke, of Toronto. It is estimated that the masonry work will require three years to complete.

TEXARKANA, ARK.—The City Council has passed an ordinance ratifying the contract with Polhamius & Co. for a system of water-works.

The Texarkana Street-Railway Co. is asking for the right of way and preparing to go to work.

BRIDGEPORT, PA.—The Town Council, October 5, passed an ordinance giving to Perot, Keen & Co., of Philadelphia, the exclu-

sive privilege of constructing water-works and laying water-pipes in streets, for furnishing a supply of water. Messrs. Supplee, Keiger, and Lyle are the Water Committee of the Town Council.

ERIE, PA.—A contract for dredging 44,000 cubic yards outside the north pier to get twenty-four feet of water. The price is between \$8,000 and \$10,000. The contractor is James Rooney, of Toledo, O.

MARSHALLTOWN, IOWA.—The contract for the Soldiers' Home has been let to Theodore Peterson, of Chicago, at \$63,740.

CEDAR RAPIDS, IOWA.—Contractors have enjoined the trustees of the Soldiers' Home at Marshalltown from proceeding with the work of construction. They claim the contract was let to two rival bidders, instead of to one, as required by law.

SAN MARCOS, TEX.—The city is proposing to buy the works of the San Marcos Water-Works Company.

LINCOLN, ILL.—On September 29 the town celebrated the completion of its water-works, put in by Moffett & Clarke, of Watertown, N. Y.

THE work of extending the Harbor of Refuge in Milwaukee Bay 350 feet in the break-water and an addition of 650 feet of super-structure on existing work will be done by H. B. Kerr & Co., of Chicago, for \$50,041.24.

EUFULA, ALA.—The city has contracted with W. D. Chapin, of Boston, to establish an artesian well system of water-works.

BROOKLYN.—The Knickerbocker Avenue sewer was officially inspected previous to being turned over to the city as completed on September 30. It has cost about \$650,000. The assistant engineer in charge, under Chief Engineer Van Buren, has been Mr. L. R. Clapp.

BOSTON, MASS.—The Aldermanic Committee on Finance is considering the advisability of appropriating \$48,000 to build a ferry-boat for the East Boston ferry.

GOVERNMENT WORK.

ABSTRACT of proposals for dredging, opened October 6 by S. T. Abert, U. S. Agent: Breton Bay, Md.: Baltimore Dredge Co., 14c. per cubic yard; George E. Ward, 14c.; American Dredge Co., 12c.; National Dredge Co., 11c.; Frank C. Sommers, 15c.; W. H. W. Morris, Agent, 12c.; James Caler & Son, 13 1/2 c.; Thomas P. Morgan, 12c.

York River, Va.: Baltimore Dredge Co., 12 1/2 c. per cubic yard; American Dredge Co., 9 1/2 c.; National Dredge Co., 11c.; W. H. W. Morris, Agent, 10c.; George E. Ward, 12 1/2 c.; Frank C. Sommers, 13c.; James Caler & Son, 15c.; Thomas P. Morgan, 11 1/2 c.

Chickahominy River, Va.: W. H. W. Morris, Agent, 25c. per cubic yard; American Dredge Co., 28c.; George E. Ward, 27c.; H. E. Culpepper, 14 1/2 c.; James Caler & Son, 23c.

CLEVELAND, O.—The following bids for dredging in harbors of Toledo and Sandusky were received by Major L. Cooper Overmann, U. S. Engineers, September 28.

Toledo Harbor, O.: L. P. & J. A. Smith, Cleveland, O., for 3,400 cubic yards, 29 1/2 c., for the entire excavation, 68,000 cubic yards, 29 1/2 c.; William J. Starkweather, Cleveland, O., 31c.; Stang & Gillmore, Lorain, O., 30c.; Carlin, Stickney & Cram, East Saginaw, Mich., 20c., 16 1/2 c.; George Talbot, Buffalo, N. Y., 30c., 30c.; William St. John, Toledo, O., 22c., 22c.; James Rooney, Toledo, O., 19 1/2 c.; Edwin H. French, Fulton, N. Y., 19 1/2 c., 22c.

Sandusky Harbor, O.: L. P. & J. A. Smith, Cleveland, O., for 50,000 cubic yards, 29 1/2 c., for the entire excavation, 100,000 cubic yards, 29 1/2 c.; William J. Starkweather, Cleveland, O., 30c., 30c.; Stang & Gillmore, Lorain, O., 29 1/2 c.; Carlin Stickney & Cram, East Saginaw, Mich., 20c., 15c.; George Talbot, Buffalo, N. Y., 30c., 30c.; Edwin H. French, Fulton, N. Y., 30c.

Carlin, Stickney & Cram lowest bidders and award recommended.

ABSTRACT of proposals opened at office of Lighthouse Board, Washington, D. C., Oct. 4, 1886, to construct and deliver at the site metal-work for the Anclote Keys, Fla., light-house: The Colwell Iron-Works, New York City, \$10,700; The Phoenix Iron Co., Trenton, N. J., \$11,250; The Sneed & Co. Iron-Works, Louisville, Ky., \$12,500; H. A. Ramsay & Son, Baltimore, Md., \$12,900; East River Iron-Works, New York City, \$12,900; Southwark Foundry & Machine Co., Philadelphia, Pa., \$14,800; The I. P. Morris Company, Phila-

delphia, Pa., \$18,200; West Point Engine & Machine Co., West Point, Pa., \$19,700; Manly & Cooper Manufacturing Co., Philadelphia, Pa., \$20,000.

NEWPORT, R. I.—Bids for dredging were opened by Lieut.-Col. Elliot, U. S. Engineer Corps, October 4. Prices are per cubic yard.

Newport Harbor: Hartford Dredging Co., Hartford, Conn., 21 1/2 c.; William H. Beard, Brooklyn, N. Y., 24c.; John McDermott, Cohoes, N. Y., 24 1/2 c.; Elijah Brainard, New York, 32c.; R. M. Payn, Albany, N. Y., 34c.; Frank Pidgeon Dredging Co., New York, 39c.; A. B. Martin, Boston, Mass., 39c.

Wareham Harbor: Frank Pidgeon Dredging Co., New York, 13 1/2 c.; E. M. Payn, Albany, N. Y., 17 1/2 c.; Atlantic Dredging Co., Brooklyn, N. Y., 18c.; Hartford Dredging Co., Hartford, Conn., 24c.; John McDermott, Cohoes, N. Y., 24 1/2 c.; Elijah Brainard, New York, 25c.

ABSTRACT of proposals for removing solid rock and boulders from the channel of Detroit River, at Lime Kiln Crossing, received and opened by Lieut.-Col. O. M. Poe, U. S. Engineers, in accordance with advertisement dated September 7. Amount of appropriation \$37,500. Dunbar & Sullivan, Buffalo, \$6 per cubic yard for solid rock in place, and \$1 for loose rock in scow; Carlin, Stickney & Cram, East Saginaw, \$6.40 and \$2.50 for solid and loose rock respectively; Hickler & Green, Sault Ste. Marie, \$6.55 for solid, and \$1 for loose rock.

ARCHITECT'S OFFICE, U. S. CAPITOL, WASHINGTON.—Proposals for two sectional steam-boilers, not less than 150 horse-power each, opened October 5: Abendroth & Root, New York, \$4,300; Hazleton Boiler Company, Washington, \$4,800; National Water-Tube Boiler Company, New Brunswick, N. J., \$4,973; Dickson Manufacturing Company, Scranton, Pa., \$4,994.49; Thomas A. Gibson, Washington, \$5,875; Babcock & Wilcox, New York, \$5,900. At the same time bids for lighting the entire Senate wing of the Capitol were opened. There were five proposals submitted—viz., Royce & Marean, Washington, \$14,995; H. G. Davis (consolidated Sawyer Mann), New York, \$19,359.80; Edison Company, New York, \$19,950; S. B. Dutcher, New York, no price given; U. S. Electric-Light Company, New York, no price given.

DREDGING in Flushing Bay, N. Y., opened October 11 by Col. D. C. Houston, U. S. Engineers, in New York City. Work to be done: Removal of about 40,000 cubic yards, chiefly mud, widening and deepening channel. Bids as here: W. H. Beard, Brooklyn, N. Y., 23c. per cubic yard; Richard Parrott, Newburg, N. Y., 19c.; Charles Dubois & Henry E. Dubois, New York, 19 1/2 c.; D. Sanford Ross, Jersey City, 17.7c.; Morris & Cummings Dredging Co., New York, 18 1/2 c.

DREDGING in Bridgeport Harbor, Conn., opened October 11 by Colonel D. C. Houston, U. S. Engineers, in New York City. Work to be done: Removal of about 140,000 cubic yards, chiefly mud, widening and deepening channel. Bids as here: Richard M. Payne, Albany, 14 1/2 c. per cubic yard; A. J. Beardsley & Son, Bridgeport, Conn., 5c.; William H. Beard, Brooklyn, 8 1/2 c.; Elijah Brainard, New York, 6 1/2 c.; D. Sanford Ross, Jersey City, N. J., 9.9c.; Morris & Cummings Dredging Co., 9 1/2 c.; Charles Dubois and Henry E. Dubois, N. Y., 7c.

DREDGING in Norwalk Harbor, Conn., opened October 11 by Col. D. C. Houston, U. S. Engineers, in New York City. Work to be done: Removal of about 20,000 cubic yards of material, chiefly mud and sand, widening and deepening channel. Bids as here: Richard M. Payne, East Albany, N. Y., 14 1/2 cents per cubic yard. A. J. Beardsley and George D. Beardsley, Bridgeport Conn., 11 1/2 cents; William H. Beard, 28 cents; Richard Parrott, Newburg, N. Y., 26 cents; Hartford, Conn., Dredging Co., 23.7 cents; D. Sanford Ross, Jersey City, N. J., 17.4 cents; Morris & Cummings Dredging Company, 18 cents.

ABSTRACT of bids for dredging in the harbors of Newport, R. I., and Wareham, Mass., opened October 4, by Colonel George H. Elliott, U. S. Engineers, at Newport: Newport Harbor—Hartford Dredging Company, 21 1/2 c.; William H. Beard, of Brooklyn, 24c.; John McDermott, Cohoes, N. Y., 24 1/2 c.; Elijah Brainard, New York, 32c.; R. M. Payn, Albany, 34c.; Frank Pidgeon Dredging Company, New York, 39c.; A. B. Martin, Boston, 39c. Wareham Harbor—E. M. Payn, Albany, 17 1/2 c.; Atlantic Dredging Company, 18c.;

Hartford Dredging Company, 24c.; John McDermott, Cohoes, N. Y., 24 1/2 c.; Elijah Brainard, New York, 25c.

DREDGING in New London Harbor, Conn., opened October 11, by Col. D. C. Houston, U. S. Engineers, in New York City. Work to be done: Removal of about 2,400 cubic yards of sand and 60 cubic yards of boulders, deepening channel over shoal. Bids as here: Richard M. Payne, Albany, N. Y., boulders \$3.98 per cubic yard, sand 40 1/2 c. per cubic yard, total \$1,210.80; Richard Parrott, Newburg, N. Y., \$5 and 49c. respectively, total \$1,476; Hartford, Conn., Dredging Co., \$6.95 and 59 1/2 c., total \$1,854; John McDermott, Cohoes, N. Y., \$8.90 and 49c., total \$1,710; Morris & Cummings Dredging Co., New York, \$9.95 and 55c., total \$1,917.

DREDGING in Black Rock Harbor, Conn., opened October 11 by Colonel D. C. Houston, U. S. Engineers, in New York City. Work to be done: Removal of about 20,000 cubic yards, chiefly sand and mud, widening and deepening channel. Bids as here: Richard M. Payne, Albany, 18 1/2 c. per cubic yard; Alonzo J. Beardsley, Bridgeport, Conn., 9 1/2 c.; William H. Beard, Brooklyn, 29c.; Elijah Brainard, New York, 9c.; Richard Parrott, Newburg, N. Y., 26c.; D. Sanford Ross, Jersey City, 17 1/2 c.; John McDermott, Cohoes, N. Y., 16 1/2 c.

LEAVENWORTH, KAN.—Synopsis of bids for iron columns, girders, beams, etc., for Post-Office, etc., opened October 7: Union Foundry and Pullman Car-Wheel Works, \$5,570; Dearborn Foundry Co., \$4,985; Haugh, Ketcham & Co. Iron-Works, \$5,693.77; Sneed & Co. Iron-Works, \$5,900; Clark, Rafin & Co., \$5,669.

GREENSBORO, N. C.—Synopsis of bids of plumbing material for Court House, etc., opened October 4: William Kirkup & Son, \$508.58; Crook, Horner & Co., \$525.25; J. Register & Son, \$549.56; Fred. Ade & Co., \$500.

TERRE HAUTE, IND.—Synopsis of bids for approaches, for stone-work, street curbing, paving, grading, sodding, etc., for Court House, etc., opened October 6: Joseph W. Lee, \$2,821.42; Terre Haute Stone-Works Co., \$3,670.

For sidewalks, Court House, etc., Terre Haute, Ind.: Stone flagging, Joseph W. Lee, \$2,415; artificial stone, Terre Haute Stone-Works Co., \$1,465, stone flagging, \$2,340; Belknap & Dumesnil Stone Co., stone flagging, \$3,045; H. J. McLaughlin, artificial stone, \$1,795.

POTOMAC RIVER IMPROVEMENT.—Synopsis of bids for about 17,000 cubic yards of rip-rap stone opened October 5 by Major Peter C. Hains, U. S. Engineers: G. Vanderwerken, 83c. per cubic yard; H. P. Gilbert, 84c. per cubic yard.

POTOMAC RIVER IMPROVEMENT.—Synopsis of bids for dredging and embankment opened October 5 by Major Peter C. Hains, U. S. Engineers: P. Sanford Ross, measured in scows, 25c. per cubic yard, measured in place, 13 1/2 c. per cubic yard; National Dredge Co., 26c., 13 1/2 c.; American Dredge Co., 28c., 14c.; W. H. W. Morris, agent, 25 1/2 c., 13 1/2 c.; Thomas P. Morgan, 28c., 15c.; Morris & Cummings Dredge Co., 27c., 17c.; F. C. Sommers, 22 1/2 c., 10 1/2 c.; Baltimore Dredge Co., 30c., 14 1/2 c.

OFFICE of Building for State, War, and Navy Departments, Washington, D. C., October 6, 1886.—Memorandum of bids for pipe covering, opened on the 4th inst., by Col. Thomas L. Casey, U. S. Engineers: Turner & Perkins, Wheeling, W. Va., 18c. per square foot, as per sample; Chalmers-Spence Co., New York, 11 1/2 c. as per samples Nos. 1 and 2, 16c. as per sample No. 3; Julius E. Hintze, New York, 18 1/2 c. as per sample No. 1, 16c. as per sample No. 2; Robert Thomas & Co., Boston, Mass., 34c. as per sample; H. W. Johns M'fg Co., New York, 22c. as per sample No. 1, 18c. as per sample No. 2; Riley Bros., Troy, N. Y., 17 1/2 c. as per sample No. A, 20c. as per sample No. B, 22c. as per sample No. C. The contract has been awarded to the Chalmers-Spence Manufacturing Company, of New York, the lowest bidders.

WASHINGTON, D. C.—Proposals have been opened as below by the Commissioners of the District of Columbia for a bridge on Anacostia Road: 130 cubic yards of rubble masonry, M. C. & L. F. Flanery, \$5.20 per cubic yard, total \$676; Hallerdy & Wilson, \$6.25 per cubic

BUILDING INTELLIGENCE.

CHICAGO, ILL.—635 W Harrison, br dwell; cost, \$21,000; o, M. C. McDonald.

Monroe and Congress, br dwell; cost, \$50,000; o, same as above.

615 W 14th, br dwell; cost, \$10,000; o, Ralph Emerson.

Canal near 18th, br malt house; cost, \$55,000; o, L. C. Huck.

Sherman near Harrison, br st and dwell; cost, \$16,000; o, W. A. Giles.

492 Larrabee, br and st flat; cost, \$12,000; o, Joe. Siegroesser; b, Jno. Neebe.

3663-67 Indiana av, br and st church, cost, \$15,000; o, Central Campbellite; b, Clark & Findlay.

444-52 37th, br dwells; cost, \$13,000; o, G. W. Parmly.

Cor. Lincoln and 35th, br and st school-house; cost, \$37,500; o, Board of Education; b, Peterson & DeLahy.

979-81 N. Halsted, br st and flats; cost, \$13,000; o, F. L. Schellenberg; a, Riggot & Koor; b, F. O. Oleson.

66-70 Fourth av, br addn to barn; cost, \$17,000; o, Am. Ex. Co.

State and Chicago av, br st and dwell; cost, \$35,000; o, H. J. Willing.

Dearborn north of Schiller, sand-stone dwell; cost, \$25,000; o, D. H. Tolman; a, W. L. B. Jenney.

Loomis, st dwell; cost, \$12,000; o, Geo. Mason; a, same as above.

Western below Polk, br dwell; cost, \$14,000; o, Frank Smith; a, Fred. Keltentich.

Throop and 19th, br dwell; cost, \$15,000; o, Joe. Donnelly; a, same as above.

N. Clark nr Fullerton, st and br dwell; cost, \$12,000; o, Mrs. E. Prouty; a, C. H. Gottig.

Lake Shore Drive nr Division, st dwell; cost, \$15,000; o, P. G. Doyle; a, same as above.

3143 Calumet av, br and st dwell; cost, \$13,000; a, Adler & Sullivan.

Sacramento av and Madison, br and st dwell; cost, \$15,000; o, Occidental Hall Co.; a, W. A. Arnold.

S. Park av and 32d, st dwell; cost, \$20,000; o, E. Lederer; a, Ahlschlager.

CHARLESTON, S. C.—Repairs to Grace Church, cost, \$10,000 to \$12,000; architect, J. H. Devereux.

DETROIT, MICH.—43 Watson, br dwell; cost, \$12,000; o, J. A. Clark; a, and b, Mason & Rice.

310 Fort, br dwell; cost, \$12,000; o, S. G. Caskey; a, and b, same as above.

160 Lafayette, br dwell; cost, \$17,500; o, A. Seymour; a, and b, same as above.

DUBUBUE, IOWA.—The Commercial Club will build a \$15,000 club house.

EVANSTON, ILL.—Br dwell; cost, \$11,000; o, Mrs. Tobey; a, F. R. Schock.

ERIE, PA.—Cor State and Turnpike st, 3-story br store; cost, \$8,000; o, M. C. Parsons; a, J. Frank; b, C. Kerner.

E. 18th st, two 2-story br stores; cost, each, \$2,500; o, Schaff Bros; a, J. Frank.

Br building for Soldiers and Sailors Home; cost, about \$9,000. Address, Major I. B. Brown at the home.

HYDE PARK, ILL.—Repairs on dwell; cost, \$10,000; o, H. B. Boque; a, W. L. B. Jenney.

Br dwell; cost, \$16,000; o, C. S. Hutchins; a, Rae & Wheelock.

JACKSON, MICH.—In progress: corner stone laid September 30; Presbyterian Chapel on Blackstone st.

KINGSTON, ONT.—It is understood the Midland Central Exhibition Buildings will be moved within the city. The cost of new buildings, etc., is put at \$30,000 to \$40,000.

KENWOOD, ILL.—Proposed private residence: o, Charles Counselman; a, Burnham & Root, of Chicago.

KANSAS CITY, MO.—Br dwell; Independence av, cost, \$27,000; o, W. W. Arnold. 3 br dwells; lot 7, block 2; o, I. M. Powers; cost, \$6,000.

BUILDING INTELLIGENCE.

MILWAUKEE, WIS.—Clinton st, br addn to factory; cost, \$5,000; o, National Knitting Co.

N W cor 8th and Vliet sts, church, parsonage and school; cost, \$25,000; o, St. Johannes Lutheran Congregation.

MINNEAPOLIS, MINN.—1714 Western av, dwell; cost, \$5,000; o, J. Lussies.

1205 4th st, br addn; cost, \$7,000; o, Schlitz Brewing Co; b, Trainor Bros.

S. E. cor Main st and 6th av, br warehouse; cost, \$12,000; o, I. A. Dale.

10 and 12 17th st, br dwell; cost, \$11,000; o, T. G. Rainey; a, W. H. Dennis.

2424 Park ave, dwell; cost, \$8,000; o, L. E. Douglass.

16 3d st, N, br store, cost, \$50,000; o, W. G. Harrison; a, W. H. Hays.

MINNEAPOLIS, MINN.—425 Cedar av, S, br store and flats; cost, \$9,000; o, C. A. Anderson.

York av, S E, dwell; cost, \$6,500; o, S. A. McGeough; b, Lister Bros.

250 3d av, N, addn. to warehouse; cost, \$15,000; o, McCormick & Wolf; a, J. Haley; b, E. G. Wolf.

2646 Portland av, S, dwell; cost, \$5,175; o, Mrs. S. Strong; a, W. D. Kimball; b, Stoddard & Arris.

NORTHFIELD, MINN.—In progress: Carleton College Observatory, 100x80 feet. Address, Prof. William W. Paine, Director.

NEWARK, N. J.—In progress: William and Shipman sts, br factory; o, Jacob Meyer & Co; a, Staehlin & Steeger.

Harrison and Paterson sts, East Newark, br build; o, Peter Hauk; a, same as above; cost, \$20,000.

NORWALK, CONN.—In progress: the Benjamin Isaacs Masonic and Benevolent Association building, corner stone laid October 8.

PITTSBURG, PA.—Mr. L. O. Danse, architect, has prepared plans for a \$30,000 5-story stone building for Eisner & Phillips, to be built next spring. Also plans for dwelling for Mrs. E. L. Bailey, to cost \$15,000.

PROVIDENCE, R. I.—There are no new buildings of any large amount, although there are smaller contracts to the amount of \$20,000.

(Continued on page 450.)

[TOO LATE FOR CLASSIFICATION.]

CONTRACTING INTELLIGENCE.

NEW YORK.—All bids for dredging at Hell Gate, East River, have been rejected, the amounts being considered excessive.

PROPOSAL.

U. S. ENGINEER OFFICE, BURLINGTON, VT., October 12, 1886.

Sealed proposals, in duplicate, addressed to the undersigned, will be received at this office until 12:30 o'clock, P. M., November 11, 1886, and opened immediately thereafter, for dredging 50,000 cubic yards from Ogdensburg Harbor, N. Y., and removing three boulders, 8, 9, and 9½ feet under water, and containing about 3, 2, and 1 cubic yards respectively, from near the mouth of the Oswegatchie River (which latter work is probably represented by one day's work of a dredge and diver), and depositing all the material removed in deep water in the St. Lawrence River abreast the city.

Specifications, forms for proposals and detailed information can be had on application.

M. B. ADAMS, Major of Engineers.

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BOOKS AND PAMPHLETS RECEIVED.

(Continued from page 473.)

ANNUAL REPORT OF THE HEALTH COMMISSIONER OF ST. LOUIS, MO. 1885-1886.

U. S. CONSULAR REPORTS on Commerce, Manufactures, etc., of their Consular Districts. No. 65, July, 1886. Published by the Department of State according to Act to Congress.

WITHIN THE HOSPITAL WALLS. A matter-of-fact narrative, arranged by Henry C. Burdett. First Hospitals Sunday Supplement of the *Lancet*. Ballantyne, Hanson & Co. London. 1886. pp. 16.

ANNUAL REPORTS OF CITY OFFICERS OF ROCK ISLAND, ILL., for year ending April 16, 1886.

SECOND ANNUAL REPORT OF THE NEW YORK STATE DAIRY COMMISSIONER. With accompanying documents. Transmitted to the Legislature, January 27, 1886. Albany: Weed, Parsons & Co. pp. 423.

REPORT OF THE DEPARTMENT OF HEALTH OF THE CITY OF CHICAGO, for the year 1885. Chicago: Cameron, Amberg & Co., Printers. pp. 124. With colored plate.

THE SANITARY ENGINEER is obtainable of News-dealers everywhere, who can get their supply of papers from any of the Branches of the American News Company.

THE THIRTEENTH VOLUME

OF

THE SANITARY ENGINEER

Comprises the twenty-six weekly issues from December 3, 1885, to May 27, 1886.

SPECIAL ARCHITECTURAL ILLUSTRATIONS

Residence of Charles J. Osborn, Esq., Mamaroneck, N. Y. McKim, Mead & White, architects, N. Y.

Residence of George F. Baker, Esq., Seabright, N. J. Bruce Price, architect, New York.

The Court of the Hotel Lallemand, at Bourges, France. Church of St. Julien, Brioude, Auvergne, France.

Residence of S. T. Everett, Cleveland, O. C. F. & J. A. Schweinfurth, architects, Cleveland, O.

Interior of residence of George F. Baker, Seabright, N. J. Bruce Price, architect, New York.

Country residence near Philadelphia. Wilson Eyre, Jr., architect, Philadelphia.

The Cambridge Hospital, Cambridge, Mass. Chamberlin & Whidden, architects, Boston.

The Western Spires of the Cologne Cathedral. American Unitarian Association Building, Boston. Peabody & Stearns, architects, Boston.

Entrance to residence of W. K. Vanderbilt. R. M. Hunt, architect, New York.

Residences near Boston. H. H. Richardson, architect, Boston, and W. R. Emerson, architect.

The House of Jacques Coeur, Bourges, France. Crematorium at Buffalo, N. Y. Green & Wickes, architects, Buffalo.

St. Stephen's College, Annandale, N. Y. Charles C. Haight, architect, New York.

A Group of Romanesque Capitals. Porch of the First Spiritual Temple, Boston. Hartwell & Richardson, architects, Boston.

The Stables at Marple Hall, England. Chicago residences. Cobb & Frost, architects, Chicago, and Wheelock & Clay, architects, Chicago.

Two Commercial Buildings. Russell Sturgis, architect, New York, and H. H. Richardson, architect, New York.

The Church of Santa Maria, at Toscanella, Italy. Interior of a residence. Arthur Little, architect, Chicago.

Residence at Chicago. Burnham & Root, architects. The De Vinne Press Building, New York. Babb, Cook, & Willard, architects, New York.

The Cathedral at Burgos, Spain. Ames Building, Boston. H. H. Richardson, architect.

Besides these there are also twenty-six illustrations of dwellings of moderate cost, specially selected, with plans.

Cottage (Small) Hospital Construction.—By H. C. Burdett. (Series continued.)

Lewisham Public Baths, England.—Plan and description.

Glasgow Corporation Baths and Wash-Houses.—Illustrated.

The Spires of the Cologne Cathedral.—Illustrated details and description by C. H. Blackall.

Fire-Proof Construction.—A series of articles by F. Collingwood, M. A. S. C. E., M. Inst. C. E.

New Civil Hospital at Antwerp.—Illustrations and description.

Details of Construction of a Crematorium at Buffalo, N. Y.

Hospital Ship *Castalia*.—Floating hospital for small-pox patients. (Illustration and description.)

The Construction of a heavy fire-proof building on a compressible soil. Illustrated by W. L. B. Jenney, architect, Chicago.

Details of construction of iron tower of Cologne Cathedral. Illustrated by C. H. Blackall, architect.

ENGINEERING.—Among the special articles of permanent engineering interest may be mentioned:

The Hell Gate Improvement.—A specially prepared illustrated article by Lieut. George McC. Derby, Corps of Engineers, U. S. Army, assistant to Gen. John Newton on the work.

Repairs to the Dam at Holyoke, Mass.

The Report of Sewerage Scheme for the Valleys of the Mystic and Blackstone. A Review.

Bound in cloth, with index, \$3. Postage, 40 cents. THE SANITARY ENGINEER, 140 William Street, New York. Obtainable at London Office, 92 and 93 Fleet Street, for 15s.

STEAM-HEATING PROBLEMS; or, Questions, Answers, and Descriptions relating to Steam-Heating and Steam-Fitting, from THE SANITARY ENGINEER. With one hundred and nine illustrations.

"THE SANITARY ENGINEER, the New York weekly journal devoted to engineering, architecture, construction, and sanitation, has embodied some of its valuable work in a volume of about 250 pages which treats of 'Steam-Heating Problems.' This contains a mass of well-digested expert information that is carefully indexed and readily available to those who design, construct, and have charge of steam-heating apparatus."—*Springfield Republican*.

"We look upon this book as a particularly valuable one in its lines. * * * The questions answered are such as are likely to come up to men practically engaged in the business embraced in the title. * * * We can confidently recommend this book." * * *

—*American Machinist*.

St. Mary's Falls Canal.—A full description of this work, with several pages of illustrations.

Schenectady, N. Y., Sewer System.—Illustrated description.

Tunnel for Foot-Passengers in Stockholm.—Description and illustrations, with reference to the adoption of the freezing method in dealing with treacherous soil.

Underground Railways in London.—A description, with illustrations, of engineering features, including the underpinning of buildings in connection with a reference to the proposed Broadway Underground Railway. The commencement of a series of illustrated articles on this important municipal problem.

Disposal of Sewage of Almshouse and Insane Asylum, New Providence, R. I., from plan by Samuel Gray, C. E.—Illustrations and description.

Water-Works Construction and Management.—Tabulated statement showing different modes of running service-pipes and prices charged for tapping water-mains.

Recent Water-Works Construction.—A series of illustrated articles describing the works of different cities: Dubuque; Hyde Park, Mass.; Liberty, Va.; Waterbury, Conn.

Slipping of the Slope Paving of the Reservoir at Lowell, Mass.

The Verruwy Masonry Dam.—Description and illustration.

Detailed Bids for Sections 12, 13, and 14, New Croton Aqueduct, N. Y.

The New Croton Aqueduct.—Continuation of the series of illustrated articles describing this great work.

PLUMBING, HEATING, AND VENTILATION.

English Plumbing Practice.—By a Journeyman Plumber. A continuation of these very practical and useful illustrated articles.

Steam-Fitting and Steam-Heating.—By Thermo. A continuation of these valuable illustrated articles.

Heating and Ventilation of Imperial Houses of Parliament, Berlin. (Illustrated.)

Heating and Ventilation of the Cambridge Hospital, Cambridge, Mass.

The Joshua Bates School, Boston.—Illustrations and description of heating, ventilation, and plumbing.

Stables of Hon. George Peabody Wetmore, Newport, R. I. Details of the arrangement and fittings. (Fully illustrated.)

Details of Plumbing in residence of Mr. William A. Burnham, Boston; Mr. Edward Kilpatrick, New York; Residence at Newport, R. I.; George Lewis, Jr., New York; Henry C. Valentine, New York; Athletic Club, New York.

Form of Plumbing Specification for an isolated country house valued at \$3,000.

Specimen of Corroded Lead-Work from Naval Museum of Hygiene, Washington, showing action of sewer-gas on unventilated soil-pipes and traps.

Examples of Dangerous Plumbing-Work in Philadelphia.—Illustrated. By Rudolph Hering, C. E.

Besides those enumerated, a great variety of illustrated descriptions, answers to questions, novelties, etc., as well as references to matter of current interest to these industries.

SANITATION.

The usual reviews of reports of health officers, and comments on current questions of interest to sanitarians and health officers.

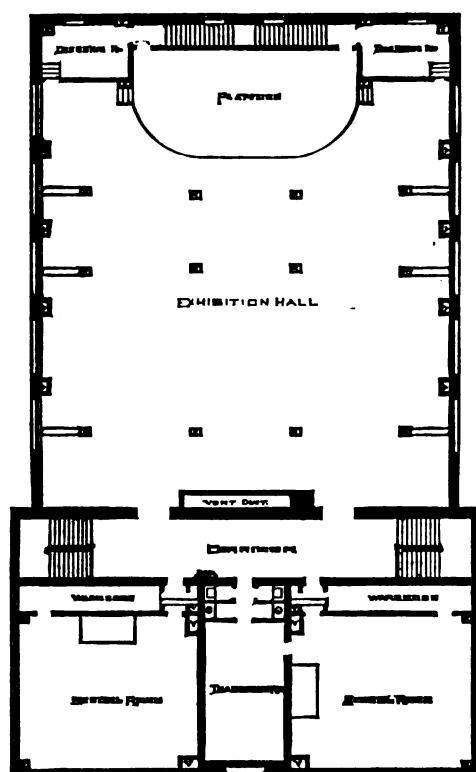
Construction and Building Notes.—In these columns will be found more items of interest to Contractors, Architects, and Engineers, such as projected work and awards of contracts, results of competitions for Public Buildings, Water-Supply, Sewerage, and Gas-Works, etc., than is found in other periodicals in the United States, largely collected by special correspondents.

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rooms, opening into the flues marked V. The hot air is supplied to the centre of the exhibition-hall through six 12"x15" galvanized-iron pipes, which ascend alongside the ventilation-pipes of the rooms below, twelve such registers being used altogether. The halls, teachers' rooms, and waiting-rooms are warmed by direct radiators located where shown on plans. The wardrobe-rooms are not warmed except by the air from the halls passing through the transoms over the doors.

Each school-room has two ventilating-flues located as indicated on the plans, and the air from the rooms passes into these flues through 20"x26" registers placed near the floor of the rooms. Each set of flues are calculated to allow for the passage of 1,400 cubic feet of air per minute for each room (25 feet per scholar per minute), with a lineal velocity of 300 feet per minute. In warm weather, when the air-supply does not require heating, the amount of air can be increased to 30 feet per scholar in the same flues, the velocity being quickened by the fan. The vent-flues in the rear portion of the building come adjacent to the wardrobes, and receive the air from them through 10"x12" registers. The wardrobe-rooms in the front portion of the building have separate vent-flues running to the attic. The ventilating-flues for the rooms under the exhibition-hall connect with a large duct between the ceil-



THIRD FLOOR PLAN
SCALE 1/4" = 1'-0"
DANIEL STREET SCHOOL

ing of second-story corridor and floor of hall above, and which rises at the back of the hall (where indicated) to the attic. The upright portion of this flue is 2'x6'. The exhibition-hall has ventilating-ducts in the false pilasters, shown on the side, and at the stage end of the hall. The vent-ducts for the rear portion of the building run to a chamber in the attic of about 12'x12', in the top of which a 72-inch Blackman fan is located, run by means of an upright shaft and belting by an engine located in the basement.

The ventilating-ducts in the front portion will be connected with a box 10 feet cube located in the front attic, in the top of which will be a 54-inch fan run by the same shaft as the other fan.

The water-closet and urinals in basement have a separate system of ventilation, produced by a 3-foot fan located in the basement, which exhausts the air and propels it into the large smoke-shaft S.

The plumbing is to be similar to that in the Harrison Avenue school-house, described in the issue of May 6, 1886, with the exception that Scott's Universal float-valve will be used for the water-closets. The total cost of the building is in the vicinity of \$100,000.

NATURAL-GAS was turned into the new 30-inch main at Pittsburg, October 8. It is claimed this is the largest gas-main ever laid.

ENGLISH PLUMBING PRACTICE.

BY A JOURNEYMAN PLUMBER.

No. LXII.

(Continued from page 396.)

SOIL-PIPES (CONTINUED).

A CASE recently occurred where complaints were made of an abominable stench issuing from a water-closet near a bedroom. An examination was made for the cause, when it was found that the waste-pipe from the slop-sink (shown in sectional elevation at A, Fig. 1) was connected to the side of the water-closet trap, on the floor below, in such a way that whatever was thrown into the sink rushed down the waste-pipe, through the water-closet trap, up the safe waste-pipe, and lay in the lead safe at B. Another sink was fixed beneath the stairs as shown at C, and sometimes when the water-closet was used liquid matter would wash back up the waste-pipe and could be seen to knock up against the grating which is soldered over the end of the waste-pipe in the sink.

The owner stated that acting on advice a new water-closet had been fixed some time ago, after which no smells were noticed until recently. He laid all the blame on the water-closet apparatus, and it was with difficulty that he could be made to understand that the water-closet was a first-class one, and that the smells arose from faulty construction of soil and waste pipes, etc.

Figure 2 is a sectional elevation of a wing of a large building in London which is occupied as offices. The vertical stack of soil-pipe is fixed inside the building and is 4½-inch diameter lead pipe. The water-closets are of the valve description and fixed over lead D-traps. In the lobby outside each water-closet are a wash-hand basin, a urinal-basin, and a lead sink on the floor for drawing water into pails for cleansing purposes. A 1¼-inch lead ventilating-pipe is carried from the top end of the soil-pipe to the roof. It transpired that for years there had always been complaints of smells escaping from somewhere, but hitherto no one had been able to discover where. Sometimes the smells were found on one floor and at other times on another, and sometimes in a water-closet, and sometimes in the adjoining lobbies, or in the offices behind. Chemical and smoke tests failed to prove any defects in the soil or waste pipes, or that the seals of any of the traps were broken. It was found impossible to break the seals of the traps by syphonage, for the reason that the branch waste and soil pipes had not sufficient fall, and in spite of violent tests the D-traps always retained sufficient water to seal the ends of the dip-pipes, but in some cases only to the extent of one-eighth to one-quarter of an inch. The examiner having called in two other persons to assist him, it was found that when two water-closets on the upper floors were used at the same instant of time, the air in the lower portion of the soil-pipe would become sufficiently compressed as to burst through the traps fixed on the floors below. After the air had escaped the water would fall back into the traps, thus leaving them sealed again. It was also found that another reason the water was not syphoned out of the traps sufficiently to break the seals was, that so many traps were connected to the same soil-pipe, that each would allow a small quantity of air to pass, which, in the aggregate, was sufficient, when added to the air entering through the 1¼-inch vent-pipe, to fill the soil-pipe and thus prevent the vacuum being sufficient to start a syphonic action in the other traps. Air-currents up the pipe-casings would sometimes carry a smell from one floor to another at a higher level. This is often very troublesome when making examinations, and the engineer is sometimes misled by this means as to the source of smells. In the case under consideration the walls were found defective so that smells could sometimes pass through to the annoyance of the people in the offices. It is proposed to ventilate all the traps and enlarge the vent-pipe at the top of the soil-pipes, also to take precautions to prevent smells from passing from one place to another. Other work should be done to make the job perfect, but cannot be done now on the score of expense.

At a large building near the Bank of England, a difficult case came under the writer's notice. Several experts had been called in at various times to discover the cause of an abominable smell that was intermittent. The fact of the smells not being continuous added to the difficulty, as no vapor-test would betray the cause in the same manner as if the smells were constant. Each sanitary man had taken away the water-closets and fixed others that he had a preference for. The one who preceded the writer had the

syphon-traps taken out and D-traps placed beneath each water-closet, but did not succeed in his object.

Figure 3 is a sketch diagram showing the water-closets and soil-pipes, which were continued to the roof full size, and the first floor was the place where the smells were complained of. After applying vapor-tests and finding nothing defective in the materials or appliances, the water-closets were taken up, and also the flooring, so as to be able to make a closer examination of the traps and pipes. Nothing being discovered to account for the smells, men were sent to the upper floors. The handles of the closets A and B being simultaneously pulled up, the writer stooping over the trap of the water-closet C to watch the result was anything but agreeably surprised to have the contents of the trap blow up into his face. This solved the mystery at once. On discharging the contents of these two water-closets, air was driven downward in each soil-pipe. The two columns of air meeting at the first-floor level burst through the traps of the water-closets at that point. Several other fittings, such as urinals and wash-

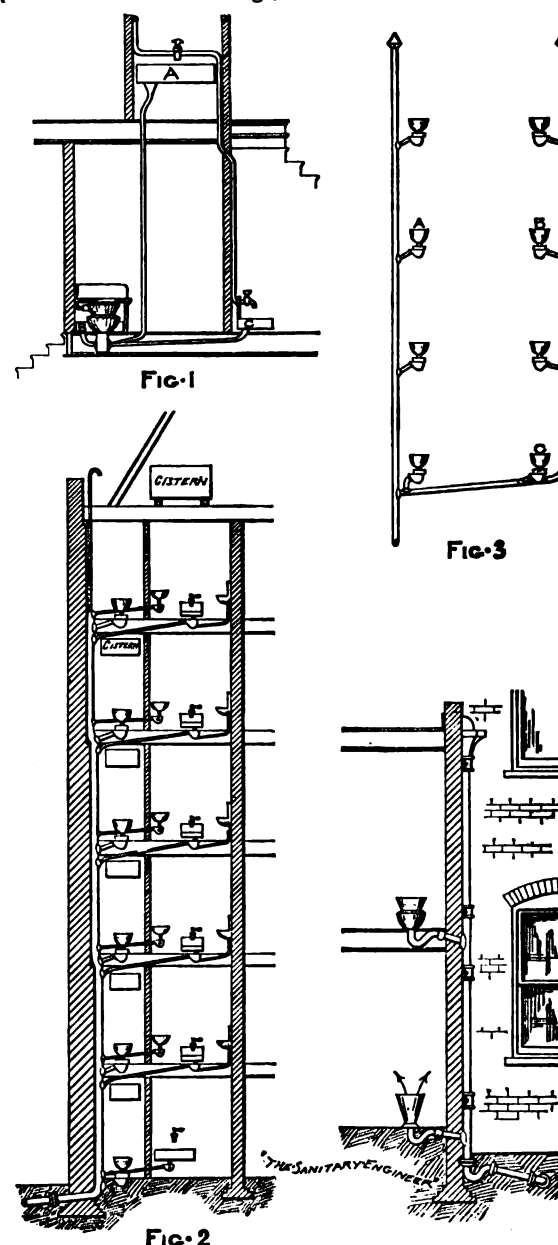


FIG-2

hand basins, were attached to the same soil-pipes, but they are omitted for the sake of clearness. The remedy applied was to take two ventilation-pipes from the traps of the first-floor water-closets and continue them to the roof. On using any one water-closet on the upper floors no evil resulted, as the air driven down the soil-pipe by the falling water, etc., could freely escape up the other one.

The above evils have frequently been found in smaller houses. Figure 4 is a sketch of the back of a very common description of house.

This kind of house has been referred to in an earlier paper, where was pointed out the evils of connecting the rain-water leader to the soil-pipe. In great numbers of cases a trap is fixed at the foot of the soil-pipe to prevent any bad air from the drains passing out at the top of the soil-pipe, etc., and into any open window. This trap seals the bottom of the pipe, with the result that the air cannot freely escape when driven downward by discharges from the water-closets. On using the top water-closet the air in the soil-pipe is driven downward and will frequently

burst through the trap of the lower water-closet. Innumerable cases could be given of defective arrangements of soil-pipes. Those that have been illustrated were simply those out of several that came first to the writer's mind and which were given as typical examples to show that even with good materials and skilled labor the whole affair may be rendered a failure for want of technical knowledge as to what will be the results when completed.

The water-carriage system of conveying sewage matter from the dwelling is one that requires a great deal of thought and study. The most elaborate water-closet apparatus is perfectly useless without the necessary water to cleanse it and float the matter deposited in it away to a suitable place. The best kind of traps are of no value if they have no water in them. Drains or soil-pipes may be made of the very best materials and yet be sources of serious evils unless the joints are both air and water tight when in or near the dwelling. All the above evils may be guarded against, and, at the same time, an error of judgment in the arrangement or setting out of the work may be committed with dire results. In olden times the plumber was simply a manipulator of lead, but now he is called upon and expected to be a highly-trained scientist. There is not the least doubt he will rise to the occasion and that in the future he will not commit the same mistakes as were made by his predecessors in the craft. This he is less likely to do, for he has the great advantage of being able to read in such papers as THE SANITARY ENGINEER, and its contemporaries devoted to sanitary science, the experiences of others and so avoid making those mistakes which he sometimes would otherwise do. This is an advantage the present generation has over the last, and there is not the least doubt they are making use of it.

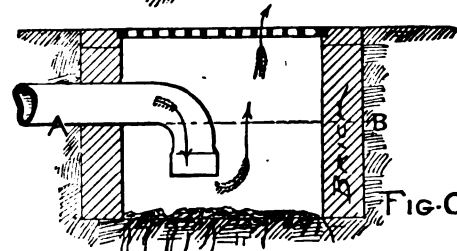
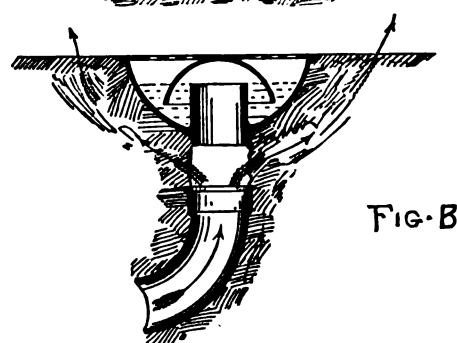
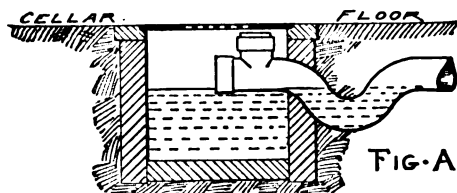
(TO BE CONTINUED.)

CELLAR AND AREA DRAINS.

BROOKLYN, N. Y., September 22, 1886.

SIR: The drainage system of the modern house has in the last few years undergone, both as to workmanship and design, a gradual change for the better, but it still possesses many crude features, such as the manner in which cellar and area drains are trapped, which serve as connecting links with the past.

Cellar and area drains are usually trapped by one of three traps—viz., running (Fig. A), bell (Fig. B), and cesspool (Fig. C). The first when used is generally well set.



The second, or bell (Fig. B), as now put on the market, has a short shank from one-half to one inch long, with such a bevel that, even were it longer, it would be impossible to calk it into a hub. This trap it is not uncommon to find connected to the drain as shown in Fig. B—i. e., with a space of several inches intervening between it and the drain. In some cases the trap is placed closer to the hub, and the plumber frequently makes a "makeshift" joint with cement or putty. Connections of this kind are only tem-

porary, as the first rough usage loosens the trap and often removes it entirely. The cesspool, Fig. C, is probably the one most often used and is made in most cases as shown in the diagram, with a porous or non-water-tight bottom so that the water can run out at the bottom as fast as it runs in at the top, and the so-called trap is no trap at all. If cesspool-traps are used they should be absolutely water-tight up to the water-line A B. If bell-traps are used they should have shanks four to six inches long, both curved and straight, for convenience in connecting to the drain, and these shanks should be calked into the hub of the drain. We believe these remarks will commend themselves both to careful architects and plumbers alike, and ought to make many of them blush for work they have passed.

L. M. II.

CHANGE IN THE PHILADELPHIA PLUMBING REGULATIONS.

(From our Regular Correspondent.)

PHILADELPHIA, October 8, 1886.

THE Board of Health has changed Rule 13 of the new rules and regulations governing the drainage and ventilation of the city under the plumbing laws by striking out the words, "or yards." This rule prohibited in its original draft the laying of a joint drain in cellars or yards parallel to street or alley where the construction of a private sewer was necessary.

The attempted violation of this rule a short time since by a wealthy builder on permission of the board was the cause of the injunction issued by the court on the application of representatives of the Master Plumbers' Association. At that time the court decided that the board did not have the power to violate one of these rules while they still were in existence. This state of affairs did not suit the board, because they claim there will arise cases wherein it is impossible for a man to comply with the rule as it stood, and they also desire to be able to meet such cases when they arise. Therefore, the rule is changed. But while the rule is changed, it seems to be the policy of the board to not grant permission for the construction of such a private drain parallel to street or alley unless convinced that it cannot be laid elsewhere in the opinion of its inspectors, and as the same rule provides that where "there is no sewer in the street and it is necessary to construct a private sewer to connect with one on an adjacent street, such plans may be used as may be approved by this department," the department will have complete control of such cases.

The rule as amended reads as follows:

"RULE 13. The main drain of every house or building shall be separately and independently connected with the street-sewer, where one is provided; and where there is no sewer in the street, and it is necessary to construct a private sewer to connect with one on an adjacent street, such plans may be used as may be approved by this department, but in no case shall a joint drain be laid in cellars parallel with street or alley. All house-drains or soil-pipe laid beneath the cellar floor shall be of proved tar-coated, extra heavy cast-iron pipe, with well leaded and calked joints, or of wrought iron, with screw joints made with paste of red lead and treated to prevent corrosion, or of first quality terra-cotta pipe with joints of the best cement. All other drain, soil, or waste pipe connected with main drain, or where main drain-pipe is above the cellar floor, shall be of tar-coated cast-iron pipe, or of wrought-iron pipe with screw joints made with a paste of red lead and treated to prevent corrosion, properly secured and carried five (5) feet outside of house-walls, or five (5) feet beyond vault, if any."

Novelties.

Under this heading we propose to describe and illustrate appliances of probable interest to our several classes of readers. The selection will be made without reference to the wishes of agents or patentees, being governed solely by considerations of novelty, ingenuity, and probable interest to readers, and especially the fact that they have not been elsewhere described. As a rule we shall make no comments, and it is to be distinctly understood that a notice does not imply approval. No charge will be made for these notices, and any offer of pay for their insertion will insure their omission. We shall be glad to have our attention called to novelties suitable for this section.

METALLIC LATHING AND FURRING.

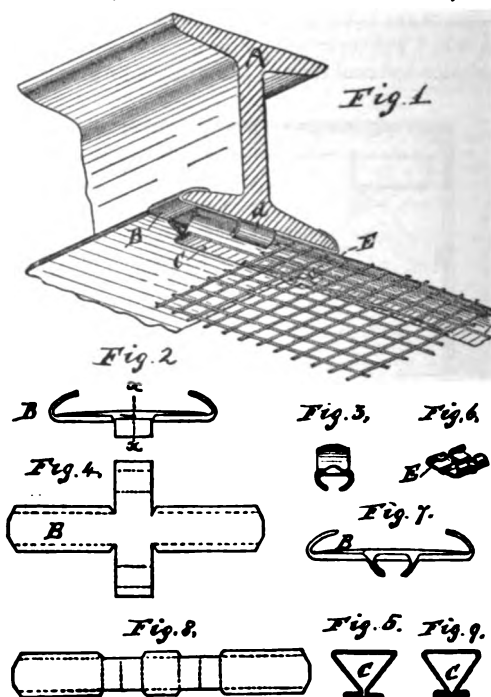
THE accompanying drawings illustrate improvements in metallic lathing recently invented and patented by Benjamin Searles, of Clinton, Mass., for the Clinton Wire-Cloth Company.

Figure 1 is an isometrical perspective view showing the lathing in position for use; Fig. 2 shows a side elevation of the hangers that hold the furring-strip; Fig. 3 is a vertical transverse section of the same on the dotted line *xx* in Fig. 2; Fig. 4 is a plan view of the blank from which the hanger shown in Fig. 2 is made; Fig. 5 is a vertical transverse sec-

tion of the furring-strip *c*, Fig. 1; Fig. 6 is a perspective view of the clamp or fastener for attaching the wire-cloth to the furring strip; Fig. 7 a side elevation showing a modification of the hanger; Fig. 8 a top plan view of the blank from which the body of the hanger shown in Fig. 7 is formed; and Fig. 9 a section showing a modification of the furring-strip.

In the drawings A represents the beam or girder, B the hanger for supporting the furring-strip, C the furring-strip, D the wire-cloth or lathing proper, and E the clamp or fastener by which the wire-cloth is attached to the furring-strip.

The body of the hanger is composed of a strip of sheet-metal having its ends bent inwardly to form flanges to embrace the flanges of the beam. The hanger is strengthened or re-enforced by a truss, consisting of a corrugated or curved strip of sheet-metal, which is placed longitudinally along the upper side of its body, and is secured in position by flanges on the body, the flanges being turned inwardly to embrace the edges of the truss. Projecting laterally from each side of the body of the hanger there is a flange which is folded or bent inwardly under



the body and then turned or bent upwardly over itself to form a lug for holding the furring-strip. The furring-strip is also composed of sheet-metal, its body being nearly triangular in cross-section, and provided with flanges or projections at the bottom, to which the clamp for securing the wire-cloth to the furring is attached.

The wire-cloth is of the ordinary texture and quality usually employed as a substitute for wooden laths and is galvanized together at the points of intersection.

The clamp E is composed of sheet-metal, and is provided with flanges which are passed through the meshes of the cloth and grasp the flange of the furring-strip by being bent on either side by a suitable implement for that purpose.

THE AMERICAN PUBLIC HEALTH ASSOCIATION AT TORONTO.

(Special correspondence of THE SANITARY ENGINEER.)

THE meeting of the American Public Health Association, and also of the Conference of State and Provincial Boards of Health, have been held during the past week at Toronto, Ontario, opening at nine o'clock on Monday morning, October 4, with a session of the latter organization at Queen's Hotel. Twenty-four States and Provinces were represented at the opening session by 38 delegates. Subjects for the consideration of this conference had been selected by the separate State boards, and were presented in the shape of a formal programme.

The first paper presented at this meeting was entitled "A Comparative View of Sanitary Laws, and what Changes are Needed in those of Maine."

This paper was presented by Dr. A. G. Young, Secretary of the State Board of Health of Maine, and was partially historical in its character, quoting at length some of the ancient sanitary laws of the colonies relative to infectious diseases and other allied subjects, and also comparing the existing statutes of the States and Provinces, and pointing out prominent defects.

A committee was appointed to codify the sanitary laws of the States and Provinces and present them at the next meeting.

The following resolutions were presented with reference to controlling the spread of infectious diseases :

"1. *Resolved*, That the bodies of persons dead from the following named diseases should not be transported outside the jurisdiction of the health authorities in which the deaths occur : Diphtheria, scarlet fever, small-pox, cholera, yellow fever, and typhus fever.

"2. *Resolved*, That persons sick with diphtheria, scarlet fever, small-pox, cholera, yellow fever, typhus fever, measles, or whooping-cough should not be transported outside the jurisdiction of the health authorities in which sickness occurs.

"3. *Resolved*, That bodies of persons dead from diseases other than those mentioned in Resolution No. 1 should not be transported except by the permission of the health officer of the locality in which the deaths occur; and in case of communicable diseases other than those named in Resolution No. 1, notice should be given to, and whenever practicable permission should be received from, the health officer of the locality to which it is desired to take the body.

"4. *Resolved*, That a permit for the removal of a dead body should be given only on assurance of its having been properly embalmed, suitably prepared, by being surrounded with disinfectants, or enclosed in a hermetically sealed metallic case."

These resolutions were followed by discussion, and were finally referred to a committee, consisting of Drs. Lee, Fisher, and Abbott.

The next question presented for discussion was, "How shall county boards of health be organized, managed, and directed, in order to secure to the State board, if such exist, the most efficient help and co-operation in general sanitary work, the reporting and proper registration of vital and mortuary statistics, and the enforcement of laws regulating medical practice in States where such enactments exist?"

Dr. C. N. Hewitt, Secretary of the State Board of Minnesota, opened the discussion upon this question. His remarks showed the necessity of harmony between the State and the local boards of health, and the need of constant encouragement from the former. He found it necessary to *run the machinery with the brakes on*. Many obstacles must be met and overcome. Dr. Hewitt finds it advisable to publish a monthly bulletin for the information of the local boards, thus enabling the State board to keep a constant communication with them, and to render them valuable aid.

Afternoon Session.

The following question was treated by Dr. John H. Rauch, Secretary of the State Board of Illinois:

"Upon what basis, on common agreement, may boards meet that are empowered to administer and enforce acts to regulate medical practice, and indirectly education, in the several States?"

"Is it feasible and wise for them to unite in a uniform policy towards medical colleges, and in the establishment of a common standard of recognition of such schools, in regard to length and number of courses of study required for graduation, preliminary requirements, percentage of graduates to matriculates, and other details of collegiate medical instruction?"

Dr. Rauch censured the laws of such States as permit the incorporation of medical colleges of inferior merit, and thus give license to quackery and fraud. He complimented the provincial methods with regard to medical education, and urged the adoption of a uniform policy in all the States and Provinces.

Dr. Henry B. Baker, Secretary of the State Board of Health of Michigan, opened a discussion on the question, "What have been the actual practical results secured, outside of large cities and towns, in preventing the spread of scarlet fever, measles, diphtheria and typhoid fever, and how is the co-operation of the medical profession and general public best secured in such work?"

Dr. Baker presented some conclusive statistics compiled from the reported returns of deaths from scarlet fever and small-pox in Michigan for the years 1869 to 1884, showing considerable reduction in these diseases since the establishment of an active State Board of Health. Other statistics were also presented relative to the prevalence of pneumonia and its relation to the average temperature of the air.

Dr. Baker also advocated the holding of sanitary conventions to awaken popular interest in the subject.

Other questions which were briefly discussed by the Conference were, "What should be the basis of compensation of local health officers?" and "How can State Boards of Health secure the best results in investigating the causes of disease?"

Evening Session.

The meeting opened with a lively discussion upon the question of merging the conference in the Public Health Association as a section of the latter, the following resolution having been offered :

Resolved, That the representatives of State Boards of Health constitute a section of the American Public Health Association, to be called the "Section of the State Boards of Health," which shall elect its own chairman and secretary, and that the Executive Committee, through the secretary arrange for the meeting of this section on the day preceding the general session of the American Public Health Association; and that the Executive Committee arrange a day or portion of a day during the general session for the exclusive consideration of matters relating to State boards of health, and for the reception of reports and propositions from the section of State boards.

After several amendments had been offered, the resolution was finally rejected.

The Committee upon "The Transportation of Dead Bodies," appointed at the morning session, reported a modification of the resolutions which had been referred to them. After a brief discussion the resolutions were rejected.

Dr. Bryce, of Toronto, who was appointed at the last meeting, reported upon the subject of "Interstate notification of infectious diseases, and co-operation in regard to inspections, and other work for the prevention of the same."

The report was discussed by Drs. McCormack, Holt, Salomon, and others, and the necessity of a uniform course of action was fully illustrated by the experience of Montreal in 1885, and also by the recent local outbreak of yellow fever at Biloxi in Mississippi.

The following resolutions were adopted at a later session of the conference :

(1) *Whereas*, It is necessary for the protection and preservation of the public health that prompt information should be given of the existence of cholera, yellow fever, and small-pox; be it *Resolved*, That it is the sense of the National Conference of State Boards of Health, that it is the duty of each State, Provincial, and local board of health in any locality in which said diseases may at any time occur, to immediately furnish information of the existence of such diseases to the boards of health of neighboring and Provincial States, and to local boards in States that have no State boards.

(2) *Resolved*, That upon rumor or report of the existence of pestilential disease, and positive definite information thereon not being obtainable from the proper health authorities, this conference recommend that the health officials of one State shall be privileged and justified to go into another State for the purpose of investigating and establishing the truth or falsity of such reports.

(3) *Resolved*, That whenever practicable the investigations made under the preceding section shall be done with the co-operation of the State or local health authorities.

(4) Any case which presents symptoms seriously suspicious of any of the aforesaid diseases shall be treated as suspicious and reported as provided for in cases announced as actual.

(5) Any case respecting which reputable and experienced physicians disagree as to whether the disease is or is not pestilential shall be reported as suspicious.

(6) Any case respecting which efforts are made to conceal its existence, full history, and true nature, shall be deemed suspicious and so acted upon.

(7) *Resolved*, That in accordance with the provisions of the foregoing resolutions, the boards of health of the United States and Canada represented at this conference do pledge themselves to an interchange of information as herein provided.

FIRST DAY.—TUESDAY.

The American Public Health Association held its first session at Shaftesbury Hall at 10 A. M., October 5. After the usual preliminary announcements of the local committee, the reports of the secretary, treasurer, and Executive Committee, the entire session of four hours was devoted to discussion of important topics connected with the subject of sewerage and sewage disposal.

The first paper, offered by Dr. George Baird, of Wheeling, W. Va., treated of the "Destruction of night-soil and garbage by fire."

The necessity of some new method of sewage disposal at Wheeling was shown in consequence of its location upon the Ohio River at a point immediately above the city of Bellaire, which was in constant danger from the sewage of the former.

A committee was appointed to report upon this subject at the next meeting of the association.

Dr. Edward Playter, of Ottawa, read a carefully prepared paper entitled, "Our inland lakes and rivers, the disposal of sewage, and the spread of infectious diseases."

The principal object of this paper was to show the carelessness and neglect of large cities in the States and Provinces in polluting their own lakes and streams, and particularly their water-supplies, as well as their selfishness in polluting the water-supplies of other communities. The constant pollution of the lakes Erie and Ontario by the

increasing population upon their shores was referred to in illustration of his subject.

A paper on the "Toronto Sewers" was read by Alan MacDougall, C. E., F. R. S. E., of Toronto.

This paper gave a very thorough account of the sewerage question at Toronto; its history, the defects of present system, or want of system, and the proposed plan which had been carefully devised, and consisted mainly in a large trunk or intercepting sewer, to convey the sewage out into the lake and deliver it thirty feet below the surface, at a point about four miles distant from the intake of the water-supply, the relative position being quite similar to that of the Chicago water-supply and sewerage plan. The writer of the paper presented some interesting statements relative to the velocity of air-currents in sewers, temperature of the air and of the sewage, direction of currents at manholes, with practical suggestions as to house-connections, and the prevention of the disposal of waste steam into sewers.

Dr. William Oldright, of Toronto, addressed the association upon the "Influence of Sewerage upon Health." He quoted the experience of foreign cities in the improvement of health, due to good drainage plans, and stated the probable effect of a new and thorough system upon Toronto. He advocated the ventilation of sewers by pipes running above the tops of houses.

Mayor Howland, of Toronto, who is an enthusiastic advocate of the proposed plan of sewerage, addressed the association, and made a very lively appeal for a declaration of their opinion upon the subject, since the question was to be submitted to the decision of the people of the city on the following day.

Discussion upon the foregoing papers followed, in which Doctors Johnson and Rauch, of Illinois, E. C. Jordan, C. E., of Maine, Doctors Devron, of Louisiana, Hunt, of New Jersey, and Cassidy, Canniff, and Covernton participated, and a resolution of endorsement was offered by Dr. Lee, of Pennsylvania, and amended by Dr. Hunt, of New Jersey. The resolution was referred to the Executive Committee. (This resolution was reported back by the committee at a later session, and unanimously adopted as the sense of the association.)

Evening Session.

The evening session was held at the Normal School building, the exercises consisting of the usual welcome on the part of the local and provincial authorities, which was most cordial and hearty in its expression toward the association. These exercises were followed by the annual address of the President, Dr. Henry P. Walcott, Chairman of the State Board of Health of Massachusetts.

The association was welcomed by Professor Daniel Wilson on the part of the citizens, Dr. Covernton on behalf of the Provincial Board of Health, Hon. A. S. Hardy on behalf of the Government, and Mayor Howland on the part of the city.

Dr. Walcott's address embraced the most important topics of preventive medicine, with special reference to the control and supervision of sanitary affairs by State and local Government authorities. It was received with unusual attention and frequent expressions of approval.

SECOND DAY.—WEDNESDAY.

The association convened again at Shaftesbury Hall at 10 A. M.

Greetings by telegram from the Board of Health of Montreal were read.

A large number of names were presented for membership, both from the United States and from Canada, and were elected by the association. Dr. J. B. Russell, Health Officer of Glasgow, Scotland, who was present, was also elected to honorary membership.

Dr. Van Bibber, of Baltimore, presented the following resolution, which was referred to the Executive Committee for action :

At a subsequent meeting—

"That since it has been proved that the hydrated oxide of methyl or alcohol is not a food nor in any way a necessary nutrient to the support of human life, but on the contrary, that its effects, when used in excess, are cumulative and contrary to the intellectual, moral, and physical advancement of man, therefore it is proper that this association should declare this, its opinion; and further, be it resolved that we are in hearty sympathy with those who desire to have its excessive manufacture in its various forms curtailed, and the means of dispensing it broadcast among men regulated by the laws of different nations."

Dr. Nathan Allen, of Lowell, Mass., offered a paper upon "The Relations between Sanitary Science and the Medical Profession."

This paper was of a general nature, treating the subject with reference to its historical, therapeutic and prophylactic bearing.

Dr. Hewitt, of Minnesota, reported for the Committee on State Boards of Health, and presented the resolutions which had been submitted to the conference on the previous day relative to "Interstate notification of infectious diseases" (already quoted).

Dr. Bryce, of the Ontario Board of Health, urged the necessity of such notification, and quoted recent instances of Russian immigrants coming to Canada by way of the St. Lawrence, in which cases outbreaks of disease had been stopped by vigorous measures.

Dr. Holt, of the Louisiana Board of Health, advocated the resolutions in his usual earnest and positive manner, denouncing the selfishness and avarice of corporations who would interfere with the action of sanitary measures. He illustrated his point by reference to the recent outbreak of yellow fever at Biloxi in Mississippi, and the methods of dealing with it in a thorough and vigorous manner. Such measures were calculated to restore confidence to the people.

The resolutions were also discussed and advocated by Doctors Ranch, of Illinois, Wight, of Michigan, and others.

Evening Session.

Dr. David Prince, of Jacksonville, Ill., read a paper upon "An experimental study in relation to the removal from the air of dust, or other material supposed to produce yellow fever, small-pox, and other infectious diseases."

Dr. Prince's scheme consisted mainly in the filtration by means of cotton of all the air passing into and out of a closed apartment.

Dr. G. B. Thornton, of Memphis, Tenn., presented a carefully prepared paper, entitled "Six Years of Sanitary Work in Memphis."

Dr. Thornton's paper gave a description of the topography of Memphis and of the epidemics of its earlier history, and especially of 1878, referring also to the sanitary measures recently adopted, the thorough sewerage system introduced, the work of quarantine and inspection, and other important measures.

He was followed by Col. D. P. Hadden, of Memphis, and also by Col. George E. Waring, C. E., who explained some of the details of construction of the sewers, especially with reference to the size of the mains, the position of the outlet, and the omission of numerous manholes, the latter point being, in his opinion, an advantage.

Dr. A. N. Bell, of New York, presented a report of the Committee on the Disinfection of Rags.

The report treated upon the general subject of rags, their importance as an article of commerce and manufacture, and their liability to convey infection, illustrated mainly by reference to foreign inquiries upon the subject.

A motion was offered to indefinitely postpone the reading of the report on the ground that the subject had been worked up and agitated in the interest of a patent disinfecting process as a boom for its stock. This was rejected, and a lively discussion followed, in which Drs. Holt, Devron, Johnson, Germer, Hewitt favored the report, while it was sharply criticised by Drs. Durgin and Abbott on the ground that disinfection was not an invariable necessity in the case of rags from non-infected countries, and also that the committee, after having been authorized to report on the subject of rags, had included many other things which were foreign to the question.

The session adjourned at midnight.

THIRD DAY.—THURSDAY.

The third day's session of the association opened at ten o'clock.

A resolution of sympathy was telegraphed to Dr. Thomas F. Wood, of Wilmington, N. C., on account of his illness.

Dr. Playter, of Toronto, submitted the following resolution:

"That in view of the necessity of preserving, so far as possible, the inland waters of this continent in a state of purity, and also of the imperfect and unsatisfactory state of public knowledge in relation to the effects of pouring sewage into waters in the proximity of public water-supplies, there be appointed a special committee of this association who shall be requested to consider the question of water-pollution by sewage, and to report at the next ensuing meeting of the association with the object of mitigating the evils of and eventually preventing the present common practice of pouring sewage, especially in its pure state, into the nearest stream or body of water;"

which, with an amendment providing for a special committee on water supplies, was referred to the Executive Committee.

A roll-call for reports from State and Provincial Boards of Health being called for, the representatives from twenty-two such boards responded, the reports in general showing commendable progress in public sanitation.

Dr. D. E. Salmon, of Washington, D. C., presented a paper on "Recent Progress in the Investigation of Hog Cholera."

Recent discoveries proved its bacterial origin, and the writer had conducted a series of experiments upon pigeons to determine the protective power of inoculation. Other experiments were made to determine the rapidity of multiplication in ordinary drinking-water, and also the question of resistance to disinfectants. It was found that a very weak solution of mercuric iodide destroyed the germs—so weak that the possibility of using this agent therapeutically was suggested.

Dr. Sternberg, for the Committee on Disinfectants, introduced Drs. Rohé and Holt. The former submitted a report upon disinfection by heat, including steam, dry heat, and boiling.

Dr. Holt submitted a model of a disinfecting chamber used at New Orleans for the disinfection of clothing and other similar articles. Into this chamber steam is injected from a boiler, and at the same time a solution of bichloride of mercury 1 part to 800 (15 gallons) is carried into the chamber with the steam through ten openings. He stated that colored fabrics were not injured by the process.

Thursday Evening.

The committee of award upon the Lomb prizes reported that no papers or plans had been offered which they deemed to be worthy of award.

Dr. Brice, of Toronto, Secretary of the Provincial Board of Health, read a paper upon "Decomposition of albuminoid substances and sanitary problems connected therewith." The subject was skillfully treated, especially in its application to the meat and milk supplies of large cities.

Dr. George Baird, of Wheeling, W. Va., presented a capital paper on street-paving (read by Dr. Reeve).

The writer advised a special form of paving-block made of fire-clay, iron ore, and silica, laid upon a bed of sand, and covered with a layer of pitch and sand.

Dr. J. B. Russell, Health Officer of Glasgow, Scotland, having been introduced by the President, addressed the Association briefly, giving his impressions of America as compared with Scotland. His address was listened to with great interest.

An interesting paper was offered by A. Blue, Esq., Secretary of the Bureau of Industries of Ontario, upon "Food in its Relation to the Distribution of Wealth."

The paper showed a thorough knowledge of the subject. It was shown that the average cost of food per capita in nineteen cities and towns of Ontario was \$47.67 per year.

Col D. P. Hadden being introduced invited the association to meet at Memphis, Tenn., next year.

Dr. H. P. Yeomans, of the Provincial Board of Health, offered an able paper on "the best methods and apparatus for teaching school hygiene in the public schools, as well as the means for securing uniformity in such instruction."

FOURTH DAY.—FRIDAY.

A short session closed the meeting of the association this morning.

Officers were elected as follows: President, Dr. George M. Sternberg, of U. S. Army.

First Vice-President—Dr. C. N. Hewitt, of Minnesota.

Second Vice-President—Dr. C. A. Lindsley, of Connecticut.

Secretary—Dr. I. A. Watson, of New Hampshire.

Treasurer—Dr. J. B. Lindsley, of Tennessee.

A paper was presented on the "Abuse of Alcoholics," by Dr. S. E. Chaille, of Louisiana, and read by title only.

The association was treated with unbounded hospitality by the people of Toronto, and the number of entertainments of every description was too large to be enumerated in this report.

The conference of State Boards of Health held several shorter sessions during the week in addition to that mentioned already, and adjourned to meet next year in Washington in September, after having re-elected Dr. McCormack, of Kentucky, as President, and Dr. G. P. Conn, of New Hampshire, as Secretary.

DR. MOORE'S RESIGNATION.

THE letter below from Dr. Balch, Secretary of the New York State Board of Health, to the *New York Times* explains itself.

"To the Editor of the *New York Times* :

"In the *New York Times* of Monday, September 20, a misleading statement appeared concerning the withdrawal of Dr. E. M. Moore, of Rochester, from the State Board of Health, which I am sure would not knowingly be indorsed by a paper claiming to be impartial. In substance it was averred that the reasons for Dr. Moore's 'resignation' were that the board had become partisan and was further hampered in its usefulness by the failure of the Governor to approve extra appropriations, which were specifically enumerated. The *Rochester Evening Post-Express*, an organ in the home of Dr. Moore, and therefore more likely to be correctly informed, in its issue of September 16, published the following fair and truthful epitome of the reasons why Dr. Moore could no longer act as a member of the State Board of Health: 'It was announced by telegraph from Albany that Dr. E. M. Moore, Sr., President of the State Board of Health, had placed his resignation of that position in the hands of Governor Hill. This is technically a correct statement, but the fact is that Dr. Moore simply notified the Executive that he had ceased to be a member of the local board [of Rochester], and that fact, according to the opinion of the Attorney-General, renders him ineligible for further service on the State board. He was appointed a member of the latter body six years ago. At its first organization he was chosen President, and has held that position until the present time. The office carried with it no salary, the members of the board simply receiving their traveling expenses when called away from home. A considerable time was devoted by the doctor to the duties of the office, which were onerous and perplexing. For reasons which were given at the time Dr. Moore declined to serve longer as a member of the local board. The State Board of Health is composed of nine members, who are divided into three classes. Three, the Attorney-General, the Health Officer of the Port of New York, and the Director of the State Survey, are members ex-officio; three are appointed by the Governor with the advice and consent of the Senate, one is a member of the local Board of Health of New York City, and the other two are members of the local boards of other cities. Hence, when Dr. Moore ceased to be a member of the board of health of this city he notified the Governor of that fact. Dr. Moore's services have been of great value to the people, as he has given careful attention to all matters coming before the board at the sacrifice of his time and to the neglect of his medical practice. His withdrawal from the board is a subject of regret to his associates, who have thus far had the benefit of his experience and sound judgment.' It need only be added in further refutation of the inaccuracies in the publication in question that while the board during the first year of its existence necessarily did much gratuitous sanitary work, it was only done for education, the policy being to have localities eventually provide the means for meeting expert services, the board confining itself to the position allowed it by law—viz., that of an advisory body. Instead of the sanitary service ceasing by following this plan, it has actually increased, towns constantly employing, under the advice of the State Board of Health, sanitary experts, thus saving the expense to the State at large. The funds of the State Board of Health have thus proved sufficient for all its wants as an 'advisory board,' and the action of the Executive in vetoing the extra appropriations has been conclusively shown to have been far-sighted, proper, and right.

"LEWIS BALCH,
"Secretary and Executive Officer, State Board of Health."

PLUMBERS' STRIKE IN KANSAS CITY, MO., SETTLED.

WE learn that the strike of the journeymen plumbers in Kansas City has been settled, the men going to work on the following terms: Men who before the strike received \$3.15 per day get \$3.50, and those receiving \$3.50 get \$4. nine hours, or from 7 A. M. till 5 P. M., to constitute a day's work, and all work after 6 o'clock to be paid for at double rates. Messrs. R. B. Farley, W. G. Ashdown, John Shaw, Doherty & Shier, Doherty & Everett, E. D. Hornbrook, Durham House-Drainage Company, Elmore & Kay, James Brewster, and James Cotter subscribed to the schedule. The other questions concerning shop management appear to have been dropped.

CONTRACTING INTELLIGENCE

For works for which proposals are requested, see also the "Proposal Column," pages 462 and 473.

CONSTRUCTION.

HOLBROOK, MASS.—At town meeting October 8 it was voted, by a large majority, to join Randolph in constructing water-works. The matter will be in the hands of W. F. Gleason, George W. Paine, and Henry N. Clark, Water Commissioners. Bonds to the amount of \$100,000 will be raised to meet the cost of the works.

WATER-WORKS EXTENSION.—On the 27th inst. an election will be held in Baltimore, Md., on the question of issuing \$1,000,000 of city bonds: For the completion of Lake Clifton (\$200,000); building a high-service reservoir (\$150,000); pumping water into Druid Lake (\$100,000); and for furnishing and laying additional water mains (\$550,000). Chief Engineer Martin of the water-works can give further information.

MILWAUKEE, WIS.—The Board of Public Works has decided to readvertise for bids for constructing the stone tower for the high-service pumping-station on the North Side.

NEWPORT, R. I.—H. A. Bentley, City Engineer of Newport, wants 1,500 lengths of 30-inch cast-iron flanged pipe. The proposals should be addressed, until October 30, to the Committee on Streets and Highways; also are wanted proposals, until October 18, for dredging and building retaining-walls of the main-sewer outlet. Address proposals to the above committee.

NEWPORT, R. I.—The deadlock existing in City Council over the Marsh Street sewer has been broken, and the work will be carried on; cost about \$35,000.

GRAND RAPIDS, MICH.—A proposition is before the Committee on Ways and Means of City Council, that the city shall build a system of wells or galleries at the head of Cold Brook and Carrier Creek, to increase the daily supply from 2,500,000 to 4,000,000 gallons daily. Meantime the Hydraulic Company is opening streets and laying water-mains, with a view to supply water, and councils call on them to show what authority they have for so doing.

TORONTO, ONT.—On October 4 representatives of Andrews & Bro., of New York, appeared before the Water Committee with a view to making a proposition to furnish additional water-supply from driven wells. A subcommittee will be sent to Brooklyn, N. Y., to examine the system there, before action is taken.

GAINESVILLE, FLA.—The Common Council is considering the question of a water-supply.

NEWARK, N. J.—The Aqueduct Board, at its meeting October 6, received several propositions for providing a supply of pure water, or for establishing plants for filtering the water-supply. D. H. Tichenor, representing capitalists of Newark, proposed to furnish 15,000,000 gallons daily from artesian wells to be sunk at Belleville, for \$150,000. Robert Crane, of Philadelphia, proposed to establish a filter bed to filter the water from the receiving basins, the city to pay the actual cost of labor and materials for constructing the same, and 20 per cent. additional to cover individual expenses. If the filter is a success, the city is to give him a certificate. The National Water Purifying Company proposes to establish a plant to purify 15,000,000 gallons daily, using the compressed air aerating process. The city to pay \$180,000. The proposition has been laid over to a future meeting.

RALEIGH, N. C.—The people are sure they need water-works, and want the matter vigorously pressed.

ALLEGHENY, PA.—Superintendent Armstrong, of the water-works, has recommended that the mains be extended to Logan's Eddy.

HALIFAX, N. S.—The dock-yard and city authorities are considering plans to intercept the city sewers which now pass through the dock-yard. It is proposed to obtain the consent of the Dominion of Canada to allow a sewer to be laid to the harbor through Dominion property, south of the dock-yard. The cost of the work is put at \$18,000.

BROOKLYN.—The Park Commissioners have before them plans for certain improvements in the "Gant," Fort Greene Park, including drinking-fountain, restaurant, and walks, prepared by Superintendent Culyer. The estimated cost according to one plan is \$29,541.60, according to the other \$29,114.90.

BROOKLYN, N. Y.—It is stated that Chief Engineer Van Buren is preparing plans for a pumping-station and other plant, to be erected at Baisly's Pond, and give an increased supply of about 5,000,000 gallons of water daily. This is regarded as preliminary to the great extension scheme, about which there is difficulty between the Board of Aldermen and the Department of City Works. This will cost \$3,000,000 or \$4,000,000.

For balance of Contracting Intelligence, see Supplement.

BOOKS AND PAMPHLETS RECEIVED.

THE HOSPITALS WEEK. Reports of special meetings, arranged by Henry C. Burdett. Second Hospitals Sunday Supplement of the *Lancet*. Ballantyne, Hanson & Co. London. 1886. pp. 8.

THE HOSPITALS WEEK. Special meetings, sermons, and results. Arranged by Henry C. Burdett. Third Hospitals Sunday Supplement of the *Lancet*. Ballantyne, Hanson & Co. London. 1886. pp. 16.

EXCERPT MINUTES OF PROCEEDINGS OF THE INSTITUTION OF CIVIL ENGINEERS. Blasting at Hell Gate, New York. By Levison Francis Vernon-Harcourt, M. Inst. C. E. London: Published by the Institute, 25 Great George Street, Westminster, S. W.

EXCERPT MINUTES OF PROCEEDINGS OF THE INSTITUTION OF CIVIL ENGINEERS. The Granada Earthquake, by Edward J. T. Manby, M. Inst. C. E.; English and American Railroads Compared, by Edward Bates Dorsey, M. Am. Soc. C. E. London: Published by the Institute, 25 Great George Street, Westminster, S. W.

(Continued on Supplement.)

Proposals.

(Continued from page 462.)

UNITED STATES ENGINEER OFFICE, MONTGOMERY, ALA., October 11, 1886.

Sealed proposals in triplicate, will be received at this office until 12 o'clock, noon, on October 28, 1886, at which time they will be opened in presence of bidders, for Rock for construction of jetties at Fort McRee, Pensacola Harbor, Fla.

The United States reserve the right to reject any and all proposals.

Specifications, blank proposals, and full information as to the manner of bidding, condition to be observed by bidders, and terms of contract and payment, will be furnished on application to this office.

R. L. HOXIE,
Captain of Engineers, U. S. A.

HEADQUARTERS SOUTHERN BRANCH NATIONAL HOME FOR D. V. SOLDIERS, HAMPTON, VA., October 12, 1886.

Sealed proposals will be received at this office until twelve o'clock, noon, Tuesday, twenty-sixth (26th) day of October, 1886, for furnishing and delivering at the Southern Branch of the National Home for D. V. Soldiers four (4) or more horizontal tubular steam-boilers, fifty-four (54) inches diameter and fourteen (14) feet long, with fronts, trimmings, tools, etc.

Specifications and drawings can be seen at this office, and further information obtained from Capt. P. T. Woodfin, Governor of the Home.

Proposals must be endorsed "Proposals for Boilers," and addressed to "Gen. William B. Franklin, President of the Board of Managers," at this office, and must be accompanied by a certified check for one thousand dollars, payable to his order, as a guarantee of acceptance of contract if awarded.

Four boilers, with fronts, trimmings, etc., to be delivered before the eighth (8th) day of December next. The right to reject any or all bids, or to waive defects, is reserved.

WILLIAM C. GUNNELL,
Civil Engineer.

OFFICE OF POST QUARTERMASTER, FORT HAMILTON, N. Y. H., September 27, 1886.

Sealed proposals in triplicate, subject to usual conditions, will be received at this office until 11 o'clock A. M. Saturday, October 16, 1886, at which time and place they will be opened in presence of bidders for moving buildings, and making connections with the water and sewer system at the Post.

Blanks and instructions to bidders furnished on application.

Envelopes containing proposals to be marked "Proposals for moving buildings and making water connections, etc.," and addressed to the undersigned.

The right to reject any or all proposals is reserved to the Government.

FRANK THORP,
First Lieut. & R. Q. M. Fifth Artillery,
Post Quartermaster.

IRON WORK, PITTSBURG, PA.—Treasury Department, Office Supervising Architect, Washington, D. C., October 12, 1886. Sealed proposals will be received at this office until 2 P. M. on the 25th day of October, 1886, for furnishing and fixing in place the iron columns, girders, and beams required for the Court-House and Post-Office Building at Pittsburg, Pa., in accordance with drawings and specifications, copies of which and any additional information may be had on application at this office or the office of the Superintendent. Bids must be accompanied by a certified check for \$300. M. E. BELL, *Supervising Architect.*

Proposals.

STEAM-HEATING APPARATUS, COLUMBUS, OHIO; JEFFERSON CITY, MO.; PENSACOLA, FLA.; SHREVEPORT, LA.; SYRACUSE, N. Y. COUNCIL BLUFFS, IA.; AND QUINCY, ILL.—Treasury Department, Office of Supervising Architect, Washington, D. C., October 8, 1886. Sealed proposals will be received at this office until 2 P. M. on the 22nd day of November, 1886, for supplying and putting in place, complete, in the public buildings, in the places above mentioned; Low-Pressure, Return-Circulation, Indirect Steam-Heating and Ventilating Apparatus, in conformity with drawings and general specification, copies of which and any additional information may be had on application at this office or the office of the Superintendents of the buildings. Bids must be accompanied by a certified check for \$500 for each building. M. E. BELL, *Supervising Architect.*

PLUMBING AND GAS-PIPING MATERIALS AT SYRACUSE, N. Y. AND QUINCY, ILL.—Treasury Department, Office Supervising Architect, Washington, D. C., October 9, 1886. Sealed proposals will be received at this office until 2 P. M. on the 25th day of October, 1886, for supplying and delivering at the Court-House, etc., buildings in the places above mentioned, all the plumbing and gas-piping materials required, in accordance with the schedules and specifications, copies of which and any additional information may be had on application at this office or the office of the Superintendents of the buildings. Bids must be accompanied by a certified check for \$200 for each building. M. E. BELL, *Supervising Architect.*

BREAKING UP AND REMOVING ROCKS. Proposals will be received until October 26, 1886, for breaking up and removing rocks from the channel of the Ohio River at the Grand Chain. Address Lansing H. Beach First Lieut. of Engineers, U. S. Engineer's Office, Custom-house, Cincinnati, O.

IMPROVEMENT OF MASSACHUSETTS AVENUE, Washington, D. C. Until October 18. Address William Ludlow, Engineer Commissioner, District of Columbia.

DREDGING channel across North River Bar, N. C. Until October 22. Available \$10,000. Address Capt. F. A. Hinman, U. S. Engineers, Norfolk, Va.

CONVERTING BUILDING into officers' quarters. Until October 16. Address, Lieut. Sedgwick Pratt, U. S. A., Washington Barracks, D. C.

IMPROVEMENT of Jackson Avenue, Jersey City, N. J. Until October 25. Quantities, 9,000 cubic yards of earth excavation; 100 cubic yards of rock excavation; 2,000 cubic yards of earth filling; 1,000 cubic yards of sand or gravel filling; 2,500 square yards of stone paving; 6,600 lineal feet of new curb stone; 2,500 square feet of new bridge stone; 2,600 square feet of flagging; 50 square yards of repaving; 600 lineal feet of reset curb stone; 400 square feet of relaid bridge stone; 1,400 square feet of relaid flagging; 11 basins to be rebuilt; 12 man-holes to be brought to grade. Address John Schweiler, Chairman of Committee on Streets and Sewers, Jersey City.

SEALED proposals will be received until noon, November 2, for materials and labor on following additions to the Asylum for the Insane, near Toledo, Ohio: Covered way, bath-house, employees' and fire department quarters, barn and stable, ice-house, physicians' residence. The estimated cost is \$33,745.75.

SEALED proposals will be received by M. J. Becker, Chief Engineer, Columbus, O., until noon, October 15, for the grading and masonry of 21 miles of the Cincinnati and Richmond Railroad, between Maplewood and New River. Most of above work is in Hamilton County, Ohio, and the projected road is the property of the Pennsylvania Company.

CONSTRUCTION OF ROADWAY to Chalmette National Cemetery, New Orleans. Until October 30. Address R. N. Batchelder, Deputy Q. M. Genl., U. S. A., office of National Cemeteries, Washington, D. C.

CONSTRUCTION OF ROADWAY to National Cemetery, at Natchez, Miss. Until October 27. Address R. N. Batchelder, Deputy Q. M. Genl., U. S. A., office of National Cemeteries, Washington, D. C.

IRON BRIDGE across Chariton River near Lewis' Mill, Chariton Co., Missouri. Until November 3. Address John A. Lee, Clerk of County Court, Keytesville, Mo.

CONSTRUCTING OFFICERS' QUARTERS, hospital and guard-house. Until October 30. Address Capt. J. W. Jacobs, Asst. Q. M., U. S. A., Atlanta, Geo.

EARTH FILLING and stone paving for Davis Island, O., dam. Until October 19. Address Lieut. Lansing H. Beach, U. S. Engineers, Custom House, Cincinnati, O.

PUMPING-ENGINES. Until October 16. Two pumping-engines, capacity 15,000,000 gallons in 24 hours, against a maximum pressure of 100 pounds per square inch. Proposals for three types as follows: First, for two horizontal, compound, duplex, guaranteed to perform a duty equal to raising fifty million pounds of water one foot high with the steam generated by the consumption of 100 pounds of bituminous coal. Second, for two horizontal, compound, duplex, guaranteed to perform a duty of eighty millions under the same conditions as stated above. Third, for two vertical double-acting, compound, beam, and fly-wheel, guaranteed to perform a duty of not less than ninety millions, under the same conditions as above. An evaporation of nine pounds of water per pound of coal consumed will be guaranteed. The plunger speed for horizontal pumps shall not exceed 100 feet per minute, and for vertical pumps 150 feet per minute. The engine-room is 43x52 feet, and 40 feet high. Foundations will be furnished by the water-works. Proposals will not be entertained for any type of engine not now in successful operation for some public water-supply. The proposals to include all necessary steam-pipes and valves, all water-pipes, including suction and discharge mains to outer walls of engine-room, and one foot-valve of a size sufficient for the supply of both pumps. Approved engine-registers, steam, water, and vacuum gauges, and all tools necessary for the proper care and working of the engines. Also, two approved duplex boiler feed-pumps, with plungers not less than 6x10 inches. One engine, if of low-duty type, to be completed and erected within seven months from date of award of contract, and the second one (if the contract be awarded for two) two months later; if either of the high-duty types is adopted, two months' extension of time will be allowed. Bidders will state the price for one engine or two engines. Address John H. Whitelaw, Superintendent of Water-Works, Cleveland, O.

Proposals.

BUILDING ENGINE-HOUSE. Until November 1. Address, Captain Charles A. Booth, A. Q. M., U. S. A., Fort Monroe, Virginia.

PILE AND JETTY WORK at Volusia Bar, Fla. Until November 9. Address Lieutenant W. M. Black, U. S. Engineers, Jacksonville, Fla.

BUILDING 300 feet of Jetty. Until November 9. Address Lieut. W. M. Black, U. S. Engineers, Jacksonville, Fla.

SLATING, Copper Roofing, Carpenter work of State House. Until October 20. Address J. Crawford Neilson, Architect, in State House, Columbia, S. C.

ORDNANCE SUPPLIES for Rock Island, Ill., Arsenal. Until October 16. Address Col. T. G. Baylor, U. S. A., commanding Arsenal.

GRAVEL ROADWAYS, curbing and sewers. Until October 16. Quantities: 23,000 sq. yds. gravel roadway on Telford foundation; 25,000 sq. yds. graveled road surface; 6,500 lin. ft. of wood curbing; 6,000 lin. ft. of pipe sewer. Address Bryan Callaghan, Mayor of San Antonio, Tex.

GRADING, CURBING, ETC., 2,000 lineal feet of Crawfish Pond, Cincinnati. Until October 18. Address Thomas G. Smith, President of Board of Public Affairs, Cincinnati, O.

ANNOUNCEMENT.

The publication of the sixth revised edition of the U. S. Pharmacopoeia (1880), containing as it does much more strict requirements for the purity and strength of pharmaceutical preparations, has been followed in some States of the Union by the enactment of laws against the adulteration of drugs, which laws make the Pharmacopoeia the official standard.

In accordance with our established policy we shall, as in the past, use our best endeavors to furnish only such preparations as shall meet pharmacopoeial requirements. We are heartily in sympathy with all efforts which aim to improve the quality of medicines, and shall continue as heretofore to exclude all low grade and inferior articles and to use our influence to promote the sale and use of pure drugs and medical preparations.

W. H. SCHIEFFELIN & CO.
New York:
175 WILLIAM STREET.

Paints.

ANNOUNCEMENT.

WE desire to call attention of consumers to the fact that we guarantee our ready-mixed paints to be made only of pure linseed-oil and the most permanent pigments. They are not "Chemical," "Rubber," "Patent," or "Fire-proof." We use no secret or patent method in manufacturing them by which benzene and water are made to serve the purpose of pure linseed-oil. Sample cards containing 50 desirable shades sent on application.

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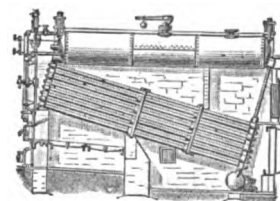
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LIEBIG COMPANY'S EXTRACT OF MEAT. An invaluable tonic. "Is a success and a boon for which nations should feel grateful."—See "Medical Press," "Lancet," etc. Genuine only with the fac-simile of Baron Liebig's Signature in Blue Ink across the Label. The title "Baron Liebig" and photograph having been largely used by dealers with no connection with Baron Liebig, the public are informed that the Liebig Company alone can offer the article with Baron Liebig's guarantee of genuineness.

LIEBIG COMPANY'S EXTRACT OF MEAT. To be had of all storekeepers, Grocers, and Chemists. Sole Agents for the United States (wholesale only) C. David & Co., 9 Fenchurch Avenue, London, England.

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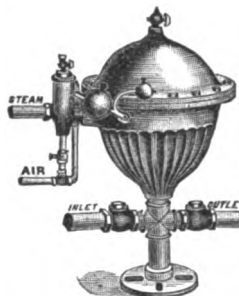
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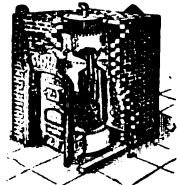
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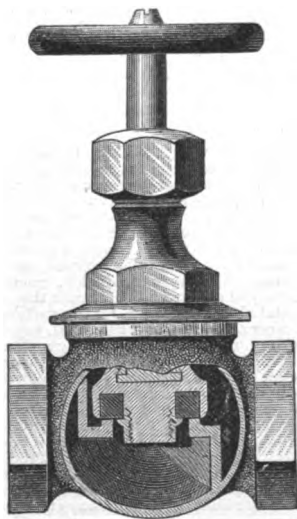
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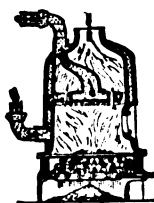
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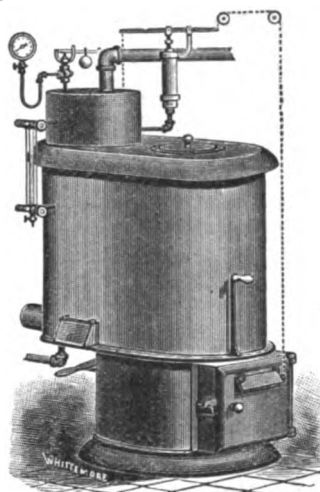
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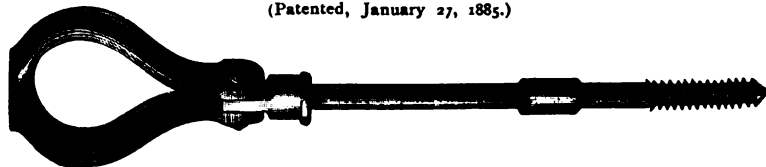
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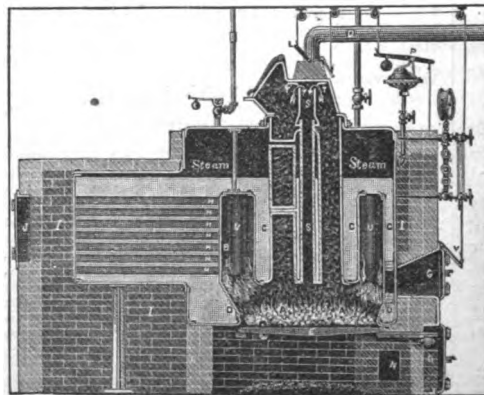
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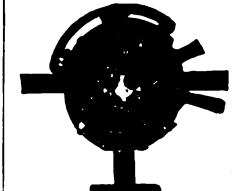
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THE BARTHOLDI STATUE.

NEXT week there is to be a grand demonstration in New York to celebrate the erection of the Bartholdi Statue on Bedloe's Island, New York Harbor. It is unnecessary to recount the facts, with which every American citizen is doubtless familiar, concerning this gift of the eminent sculptor Bartholdi, the generosity of the citizens of France who paid for the statue, and the energy and ceaseless work of the American Committee, aided by the *New York World*, who have secured the money from American citizens to pay the cost of the pedestal and erection of the statue. This, however, seems an opportune time to present our readers with an accurate description of the engineering features of this important work. This will be found elsewhere in this issue. Moreover, the reproduction from a specially made drawing of a view of the completed statue seemed to be an appropriate subject for our regular special architectural illustration.

THE BURSTING OF THE GRAVESEND WATER TOWER.

THE destruction of a water-tower 250 feet high, at Gravesend, Long Island, an accurate description of which we give our readers elsewhere in this issue, is a matter of much interest to engineers, and should teach a valuable lesson to laymen and contractors. This affair emphasizes the fact that no engineering work should be done except under carefully prepared plans and specifications, and that steel should not be used for any important purpose without having been subjected to intelligent and properly conducted tests and rigid inspection, and in this matter the requirements should be stated by a skilled engineer who has had special experience in this branch of work. Rule-of-thumb practice or the mere opinion that it is "good enough" will not do.

THE BAD PLAN OF USING A BROOK AS A SEWER.

THE presence of a small stream running through a village is very tempting to advocates of putting nuisances out of sight without regard to their ultimate disposal. When the stream becomes polluted by the drainage of the adjoining populated region some one is sure to suggest that it be arched over and made a sewer.

In general, it may be asserted positively that this a bad plan. There may be exceptions occasionally to this broad assertion, but they are so rare as not to be worth taking into consideration in a general consideration of the subject.

A small natural stream is liable to excessive fluctuations. In dry seasons its flow will be very slight, and after heavy showers it will be a turbid torrent. Any channel to carry its waters must be of a capacity many times greater than is needed for certainly nine-tenths of the time. The occasional flushes which it receives from storm-waters are not sufficient to keep it clean and sweet during the intervals of small flow and slight fluctuations.

A channel for conveying sewage-water ought to be adapted to keep itself clean by its natural flow as nearly as practicable, and to effect this object it must have a limited capacity and be capable of frequent flushing with a quantity of water only slightly in excess of the greatest flow likely to occur during the hourly fluctuations of the household use of water.

This fluctuation is theoretically, according to German experiments, between 38 and 190 per cent. of the average hourly flow during the day. According to some American experiments the variation lies between 55 and 130 per cent. of the average hourly flow. This flow is quite constant during the year, and it may safely be assumed that a sewer to act efficiently need not, and indeed ought not, to be larger than is essential to carry when full double the average daily quantity of sewage likely to reach it.

It is easy to see that the size and cost of such a sewer will be much less than that of arching over a natural water-course and making it large enough to convey flood-waters.

A small marginal sewer along each side of a water-course properly constructed, with its size and grade determined by a competent expert engineer—not guessed at by a committee or a local surveyor unskilled in the subject—will cost less and be more effective, nine times out of ten, than will the water-course itself when arched over and sewage turned into it.

BATHS FOR THE POOR IN CHICAGO.

FOR several years past THE SANITARY ENGINEER has been illustrating and describing public baths in the different cities in Great Britain with a view of encouraging some philanthropically disposed persons to construct bath-houses in the large cities of the United States, where the poor could bathe at a nominal price during the winter months. We are now pleased to see that Chicago has been the first city in this country to make a move in this direction. Mr. Ruggles, an energetic business man of that city, has put up a building at No. 63 West Madison Street, where he is able to furnish 800 baths per day. There is a department for men and boys and a department for women and children. The prices charged for the baths vary from three cents to ten cents. It is not intended to make money out of the enterprise, but simply that it shall be self-sustaining. The *Inter-Ocean*, in referring to this public-spirited action, very properly says, "A more practical charity has not been started in Chicago."

THE FEVER AT BILOXI.

IN THE SANITARY ENGINEER of September 23, page 399, allusion was made to the fact that some cases suspiciously like yellow fever had occurred at Biloxi, Miss., and that a great outcry had been made against the Louisiana State Board of Health because it had quarantined against Biloxi when there was no sufficient cause, a surgeon of the Marine Hospital Service having pronounced the cases to be nothing but malarial

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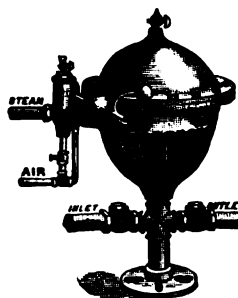
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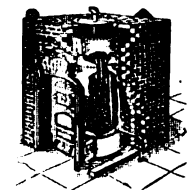
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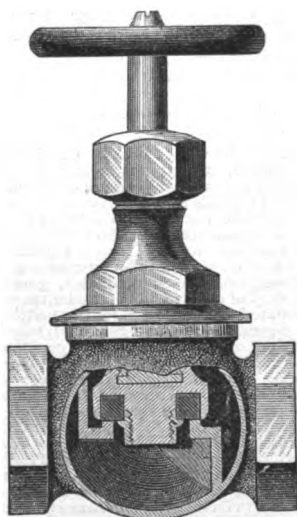
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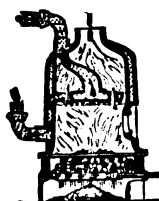
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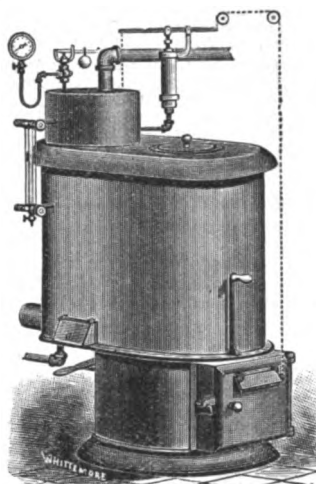
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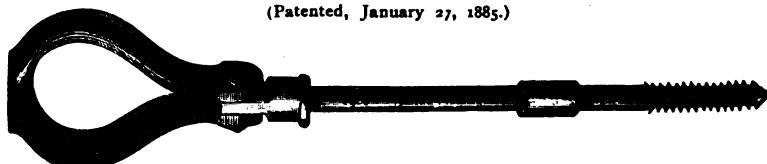
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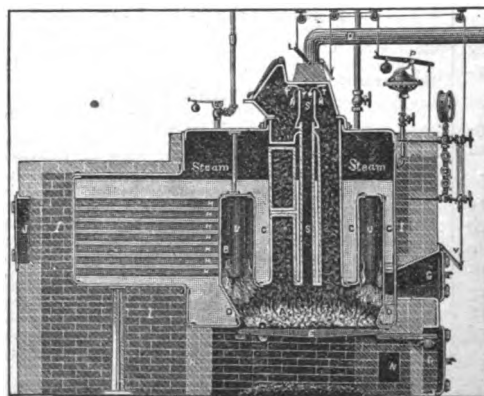
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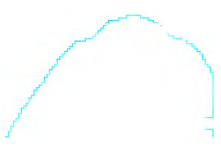
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THE BARTHOLDI STATUE.

NEXT week there is to be a grand demonstration in New York to celebrate the erection of the Bartholdi Statue on Bedloe's Island, New York Harbor. It is unnecessary to recount the facts, with which every American citizen is doubtless familiar, concerning this gift of the eminent sculptor Bartholdi, the generosity of the citizens of France who paid for the statue, and the energy and ceaseless work of the American Committee, aided by the *New York World*, who have secured the money from American citizens to pay the cost of the pedestal and erection of the statue. This, however, seems an opportune time to present our readers with an accurate description of the engineering features of this important work. This will be found elsewhere in this issue. Moreover, the reproduction from a specially made drawing of a view of the completed statue seemed to be an appropriate subject for our regular special architectural illustration.

THE BURSTING OF THE GRAVESEND WATER TOWER.

THE destruction of a water-tower 250 feet high, at Gravesend, Long Island, an accurate description of which we give our readers elsewhere in this issue, is a matter of much interest to engineers, and should teach a valuable lesson to laymen and contractors. This affair emphasizes the fact that no engineering work should be done except under carefully prepared plans and specifications, and that steel should not be used for any important purpose without having been subjected to intelligent and properly conducted tests and rigid inspection, and in this matter the requirements should be stated by a skilled engineer who has had special experience in this branch of work. Rule-of-thumb practice or the mere opinion that it is "good enough" will not do.

THE BAD PLAN OF USING A BROOK AS A SEWER.

THE presence of a small stream running through a village is very tempting to advocates of putting nuisances out of sight without regard to their ultimate disposal. When the stream becomes polluted by the drainage of the adjoining populated region some one is sure to suggest that it be arched over and made a sewer.

In general, it may be asserted positively that this a bad plan. There may be exceptions occasionally to this broad assertion, but they are so rare as not to be worth taking into consideration in a general consideration of the subject.

A small natural stream is liable to excessive fluctuations. In dry seasons its flow will be very slight, and after heavy showers it will be a turbid torrent. Any channel to carry its waters must be of a capacity many times greater than is needed for certainly nine-tenths of the time. The occasional flushes which it receives from storm-waters are not sufficient to keep it clean and sweet during the intervals of small flow and slight fluctuations.

A channel for conveying sewage-water ought to be adapted to keep itself clean by its natural flow as nearly as practicable, and to effect this object it must have a limited capacity and be capable of frequent flushing with a quantity of water only slightly in excess of the greatest flow likely to occur during the hourly fluctuations of the household use of water.

This fluctuation is theoretically, according to German experiments, between 38 and 190 per cent. of the average hourly flow during the day. According to some American experiments the variation lies between 55 and 130 per cent. of the average hourly flow. This flow is quite constant during the year, and it may safely be assumed that a sewer to act efficiently need not, and indeed ought not, to be larger than is essential to carry when full double the average daily quantity of sewage likely to reach it.

It is easy to see that the size and cost of such a sewer will be much less than that of arching over a natural water-course and making it large enough to convey flood-waters.

A small marginal sewer along each side of a water-course properly constructed, with its size and grade determined by a competent expert engineer—not guessed at by a committee or a local surveyor unskilled in the subject—will cost less and be more effective, nine times out of ten, than will the water-course itself when arched over and sewage turned into it.

BATHS FOR THE POOR IN CHICAGO.

FOR several years past THE SANITARY ENGINEER has been illustrating and describing public baths in the different cities in Great Britain with a view of encouraging some philanthropically disposed persons to construct bath-houses in the large cities of the United States, where the poor could bathe at a nominal price during the winter months. We are now pleased to see that Chicago has been the first city in this country to make a move in this direction. Mr. Ruggles, an energetic business man of that city, has put up a building at No. 63 West Madison Street, where he is able to furnish 800 baths per day. There is a department for men and boys and a department for women and children. The prices charged for the baths vary from three cents to ten cents. It is not intended to make money out of the enterprise, but simply that it shall be self-sustaining. The *Inter-Ocean*, in referring to this public-spirited action, very properly says, "A more practical charity has not been started in Chicago."

THE FEVER AT BILOXI.

IN THE SANITARY ENGINEER of September 23, page 399, allusion was made to the fact that some cases suspiciously like yellow fever had occurred at Biloxi, Miss., and that a great outcry had been made against the Louisiana State Board of Health because it had quarantined against Biloxi when there was no sufficient cause, a surgeon of the Marine Hospital Service having pronounced the cases to be nothing but malarial

fevers. It is now announced by telegraph that New Orleans has again quarantined against Biloxi on account of a fever which has been prevailing there for several weeks, which has caused a number of deaths, and as to the nature of which the physicians of the town are by no means agreed. It is fortunate that the end of the warm season is so near at hand, whether this proves to be yellow fever or not.

NORTHERN COLORADO IRRIGATION COMPANY.

REFERRING to our article on "Flow of Water Underground," in THE SANITARY ENGINEER of September 30th, Mr. George G. Anderson, the engineer, writes that his company had no intent of disobeying the law as the note by "another correspondent" would seem to imply; but that, on the contrary, "so soon as we were apprised by the proper officer—the Water Commissioner of the dis-

OUR BRITISH CORRESPONDENCE.

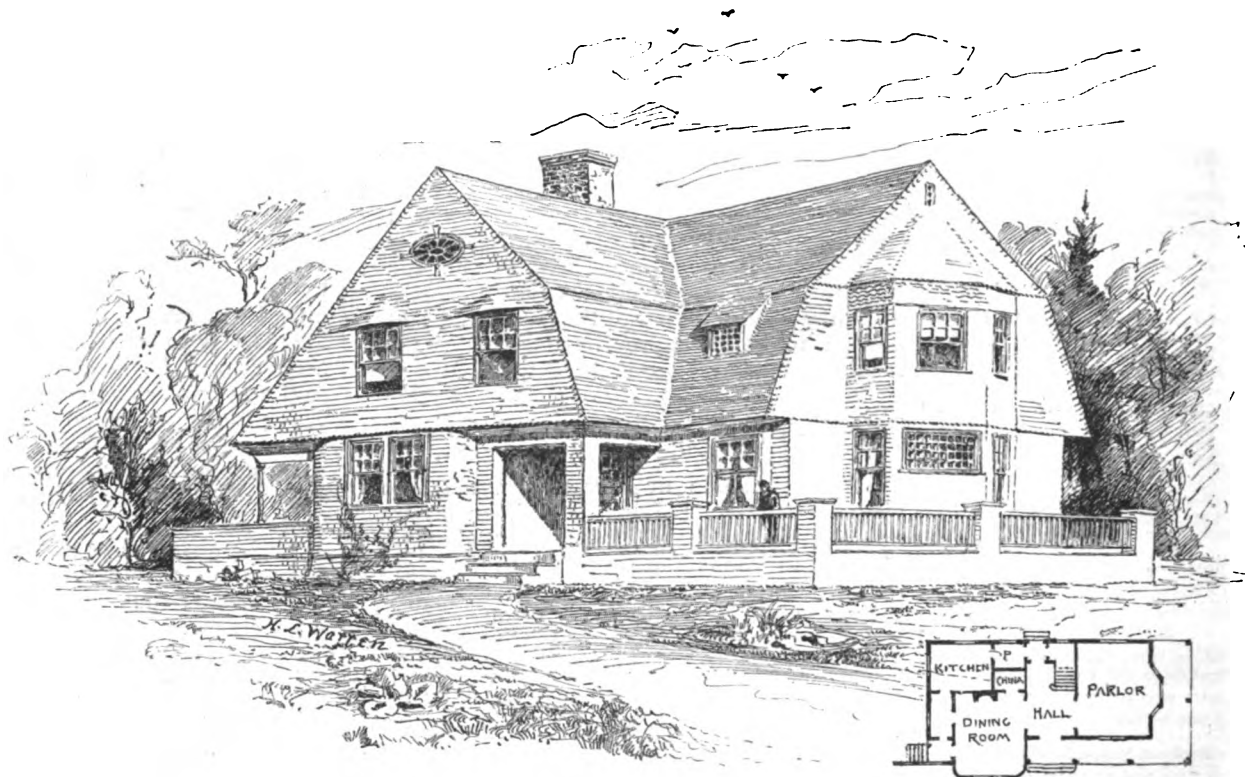
Danger of Suction-Pipes to Bathers in the Thames—Electric Tram-Car for New York—Eels in the East London Water Company's Mains.

LONDON, October 2, 1886.

Attention has been drawn to the danger arising from the mouths of suction-pipes belonging to large factories which open into the bed of the river. The occasion was the drowning of a lad aged ten in the Thames. It appears that Price's Candle Factory, at Battersea, has such a suction-pipe, and, although there is an old notice-board drawing attention to the dangerous nature of the spot, there is no further protection for the lads who may choose to bathe there. In the present instance the boy was sucked into the hole at the mouth and was drawn into the pipe. Twenty lives have been lost on the spot within the last two years.

An electric tram-car, constructed to carry seventy passengers, has been under trial for several days in the streets

Publication of the fact that eels are present in the mains of the East London Water-Works Company's system has caused considerable discussion. The presence of the eels has been admitted for the past five or six years, report having been made to that effect by the Water Examiner in August, 1884. The matter again is prominently brought forward, owing to a case of typhoid fever occurring in Stratford (London, E.), and alleged to have resulted from the pollution of the water-supply, owing to the presence of a dead eel in the service-pipe. Sir Francis Bolton, the Water Examiner of the Metropolis, made investigation and pointed out that an open sewer ran by the house in which the illness occurred, while the sink-waste was in direct communication with the drain. It is stated that samples of water tested on the spot showed no organic matter, and that Dr. Tidy gives his opinion that a decomposed fish would not pollute the supply sufficiently to produce typhoid. The eel in question had passed through a ½-inch service-pipe, and had been killed by the turning of the stop-valve outside the houses. The company serves some 150,000 houses, with a population of 1,170,000, and



A COTTAGE AT WEYMOUTH, MASS.—W. A. NORRIS, ARCHITECT.

trict—that there was a scarcity of water, and that he would curtail our supply to provide for others having their prior rights, his authority was recognized to the fullest extent; and *more*, the course pursued to relieve the distress from lack of water was suggested by the manager of this company."

He also writes that the legal question as to the right of any person to claim water by tendering the water-rent at the rate of \$1.50 per acre is still in the courts. The decisions thus far reached have only been upon legal points, and have not been upon the matter at issue.

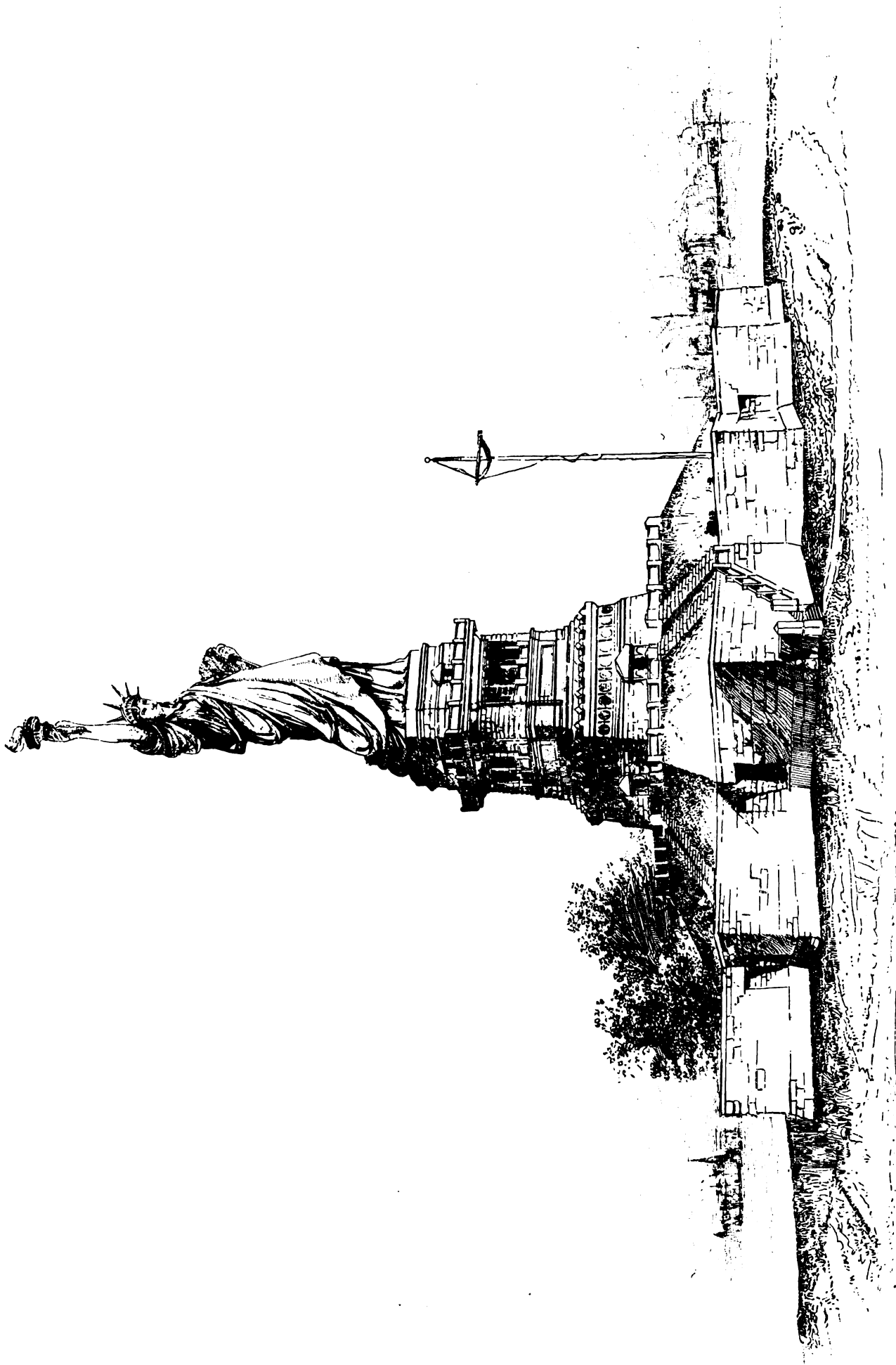
SEWERAGE IN DELAWARE, O.

A CITIZEN of Delaware, O., in a communication to the *Gazette*, advocates the arching of Delaware Run, a small stream which flows through the town, and converting it into a sewer. There is no public water-supply. A thriving town like this ought to have water-works and a decent system of sewerage, and not resort to any injudicious expedients like the one proposed,

of Brussels. The Julien Electric Company are the constructors, and the motive power is afforded from accumulators. I understand that this car, the working of which has given perfect satisfaction to the inspecting engineers, is destined for New York. Another electric car and locomotive, turned out by the Electric Locomotive and Power Company, has just been tested on part of the North Metropolitan Tramway Company's system in the north-east of London. The experimental run was about three miles and gave satisfaction. The motor is on the Edison system, and calls for no alteration of the existing "road." The car is also lighted with electricity from the engine, such lighting entailing only a fractional additional cost. It is estimated that the cost of installation, charging-stations, and engines to replace horses will not cost more than the purchase price of the latter, plus their stabling and harness, while the cost of maintenance would be forty per cent. less. Further, it is estimated that the saving on the cost of haulage would be 2d. (4c.) per mile, or an annual saving of £50,000 (\$240,000) over the whole of the company's system. Parliamentary powers would be necessary before the adoption of electricity in place of horse-power.

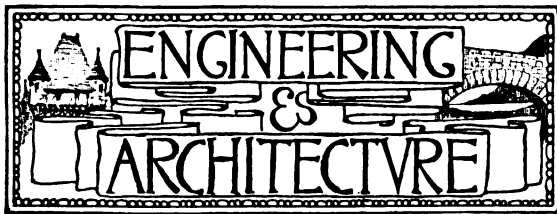
the water engineer apparently takes credit for the fact that during the past fortnight only seven cases of stoppages owing to eels have occurred. Proportionately, seven cases is not many, but it is probably seven cases too many from such a cause. The origin of the difficulty is assumed to date from the collapse of the filter-beds about six years ago, when the unfiltered water escaped into the filtered basin, whence the eels could find their way into the mains and house-connections, where they have since increased largely in number. All efforts to dislodge them have proved ineffectual, the result of blowing off a main into the street having frequently been unsuccessful, so far as finding a single eel is concerned. There are 780 miles of main, from three inches to four feet, besides house-connections, and the supply is constant. In order to clear all this length of pipe simultaneously, it would be necessary to deprive the district of water for several days. The pressure varies from 30 to 100 pounds, and it is a marvel that the eels can withstand it. They are stated to be quite white and blind.

SAFETY-VALVE.



THE SANITARY ENGINEER ILLUSTRATED SERIES.

THE BARTHOLDI STATUE, NEW YORK HARBOR.



OUR SPECIAL ILLUSTRATION.

THE BARTHOLDI STATUE, NEW YORK HARBOR.

OUR ILLUSTRATION OF A MODERATE-COST HOUSE.

A COTTAGE AT WEYMOUTH, MASS.—W. A. NORRIS, ARCHITECT.

THE subject of our vignette illustration this week is the residence of Mr. F. O. Wellington, at Weymouth, Mass. It is a frame house covered with shingles both on walls and

THE BARTHOLDI STATUE.

THE interesting work of building the pedestal and erecting upon it the Bartholdi Statue is rapidly approaching completion. The illustrations elsewhere in this issue show the general details of the structure. The statue when received in New York was complete in itself, the envelope and internal frame-work being ready for erection. The plans for the foundation and for the supporting girders and ties have been made and the erection done under the supervision of General C. P. Stone as engineer. For a time Colonel S. H. Lockett acted as assistant engineer, and afterward Mr. P. F. Simpson. Mr. William Kenish acted as chief inspector of beton, the designs for the pedestal being by Mr. Richard M. Hunt, of New York.

The foundation of the pedestal is ninety-one feet square at the bottom, sixty-five feet square at top, fifty-two feet ten inches high, and rests on a compact bed of gravel and boulder clay at eight feet above high tide. The faces are not battered, but drawn in by horizontal offsets, the vertical distance between being four times the offset. There is a central well-hole ten feet square, and at the ground-surface arched passageways ten feet wide and nine feet high give

part Rosendale cement, one of Portland cement, two of sand, and seven of broken trap-rock. The upper twenty-five feet were of two parts Portland, two sand, and seven broken trap, except that the extreme upper part was one of Portland cement to four of trap-rock screenings.

This concrete was mixed by hand, but that in the interior of the pedestal was thoroughly incorporated in a mixer run by steam-power consisting of a cubical box rotating on tubular axes fixed at diagonally opposite corners.

The water for wetting the mass was carefully measured and introduced through the axes. When the concrete was put in place it was rammed until water flushed to the surface.

One barrel of cement from every ten used was selected for test. From this five briquettes were mixed neat, and five with sand and cement 1 to 1, and three of each mixture were tested at the end of twenty-four hours. The requirements were that the Rosendale briquettes should not break at less than forty pounds per square inch in twenty-four hours. All samples were examined also as to fineness of grinding.

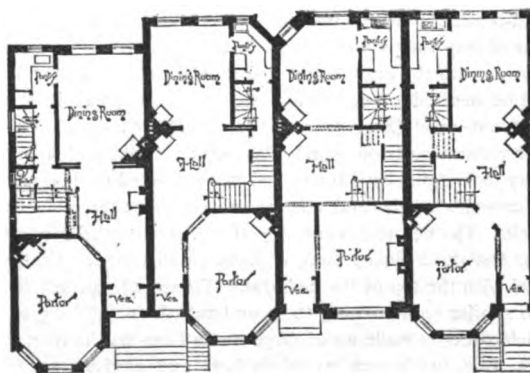


A ROW OF CHICAGO DWELLINGS.—COBB & FROST, ARCHITECTS.

roof. The interior is finished in pine and stained. The cost of the house was about \$4,000. The architect was Mr. Wilfred A. Norris, of Boston.

A ROW OF CHICAGO DWELLINGS.—COBB & FROST ARCHITECTS.

THE subject of our vignette illustration this week is a row of four dwellings in Chicago, owned by Mr. Robert D. McFadon. Fronts of pressed brick, with Connecticut brownstone trimmings. Interior finish, parlor cherry, dining-room and hall of oak, second floor natural-finished pine. The cost of the row was about \$28,000. The architects were Messrs. Cobb & Frost, of Chicago.



FLOOR PLAN

THE architects of St. Paul have been invited by the Committee on Plans of the Ice Carnival to submit plans for the ice palace to be erected this winter. The party submitting the accepted plan receives \$200. The preparations for the ice palace and the carnival season are already well under way.

access to this from each face of the foundation. For fifteen feet eight inches of the height the concrete composing the foundation was made from Rosendale cement mixed in the proportion of two parts of cement, two of sand, and seven of broken trap-rock. The next twelve feet were mixed one

Compressive tests were made on ten ends of these briquettes from Rosendale cement mixed neat, and ten from some mixed with sand at the age of twenty-seven months. The former yielded at an average pressure of 3,526 pounds per square inch, the minimum being 2,679 pounds, and the maximum 4,567 pounds, the average tensile strength at same age being 514 pounds. The ones mixed with sand gave minimum 1,949 pounds, maximum 3,480 pounds, and average 2,471 pounds, the tensile strength being minimum 286, maximum 388, and average 372 pounds.

Some interesting compressive tests were also made on 12-inch cubes of Rosendale cement concrete mixed two of cement, two of sand, and seven of broken trap-rock. The concrete was taken from one of the regular batches, and after setting the samples were occasionally sprinkled with water to give about the same amount of water that the structure would receive from rain and snow upon it. At the age of six months one of the cubes yielded under a pressure of 58,700 net tons. At the age of twenty-seven months, four cubes yielded at an average pressure of 97,500 tons, and at the age of twenty-eight months one cube

yielded at 104,544 tons. These figures give respectively 813 pounds, 1,354 pounds, and 1,452 pounds per square inch.

Figure 1 shows the openings heretofore mentioned, and also a section of the arches which will span the space between the foundation and the old walls of the fort. On each face of the pedestal these arches will support a flight of steps ten feet wide, with the grassy mound between them and the terrace. They will be built of concrete and made three feet thick at the foundation mass, and five feet at the springing, the chord of the arc being forty-nine feet. The terrace will be 15½ feet wide in the clear, and will be surrounded by a parapet. The exterior of the island is surrounded by a low sea-wall, and there is a grassy slope between it and the foot-walls.

The pedestal is 89 feet high, its top being 149 feet 10 inches above high tide. It is about 64 feet square at bottom and 43½ feet square at top, and has a vertical central opening 27 feet square throughout. On each face there is an opening to the bottom of this space four feet eight inches wide and ten feet high. These openings are joined

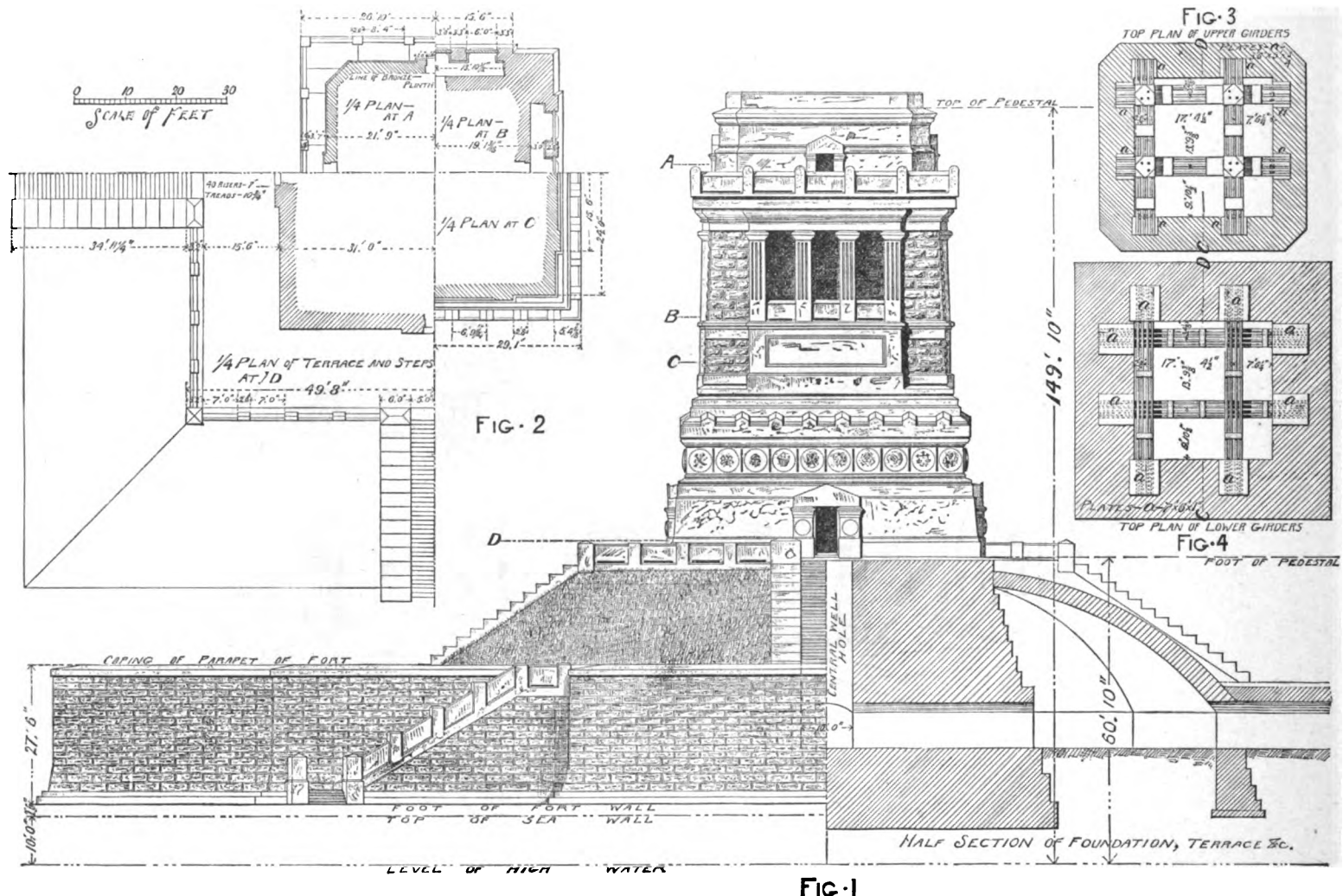
the coats-of-arms of the several States in bronze placed upon them, while those at the sides of the entrances will contain the monograms of the Republics of France and the United States. The projections on the sloping offset above the former serve not only for ornamentation, but also as "cover-joint stones" to the joints in the course below, recesses two inches deep being cut into the vertical face of the adjoining course so as to give a bond in all directions.

The exterior of the masonry is of granite from Leet's Island, Conn., and is mostly of "pointed" work, but that adjacent to the loggias and the panels below is in very bold "rock-faced" work with eight inches projection. All the stone is laid in Portland-cement mortar, mixed of one part of cement to one of fine trap-rock screenings, and all joints, both horizontal and vertical, are ¾-inch thick, except that vertical joints for a part of the distance at the rear of the stones are wider. The courses have risers of one foot six inches to two feet six inches, and are carefully bonded, at least a foot break of joint being required in all directions. The granite courses form a facing to an interior of Port-

girders enter three feet six inches into the masonry at each end and rest on steel plates 5'x3½'x1'.

At three feet nine inches from each end of all the girders a set of four steel eye-bars, each 5x1 inches, is attached by a 4½-inch pin with head and nut, making thirty-two bars in all. These are twenty-five feet eight inches long between centres of pins (see Fig. 6) and reach down to a second similar set, and these in turn are attached to eye-bolts 3½ inches square, with up-set ends (the screw-threads being 4½ inches diameter), which finally take hold of the lower pair of four other steel cross-girders (Fig. 4). These each consist of four made channels forty-one feet long, having webs 36x¾ inches, with angles 4x5x¾ inches top and bottom. All have vertical stiffening-plates and angles, to resist shearing strains, and top and bottom connecting-plates at various points. They enter the masonry seven feet at each end, and have bearing-plates 7'x6'x1' above. The washer-plates below the lower pair are 3'3"x15'x1¼", and the conical washers are one foot deep and cast with vertical ribs.

The specifications for the steel-work call for steel that



PEDESTAL OF THE BARTHOLDI STATUE.

by lateral galleries five feet wide and seven feet three inches high, for the purpose of lightening the mass. The "plan at B" shows a section through the loggias. These are twenty-six feet seven inches high, twenty-seven feet eleven inches wide, and three feet deep in the clear, and are entered from the interior by rectangular openings as shown. The columns are three feet three inches wide, with spaces of six feet between. The "plan at A" (Fig. 2) shows the balcony at top, which has a clear width of three feet seven inches, and extends around the pedestal. The posts of the parapet to the balcony are 2x2 feet and 4 feet 8 inches high, and the top of the coping is 3 feet 8½ inches above the floor. The panels are 6 inches by 2 feet 9¾ inches, and are raised from the floor to give space for drainage.

Care has been taken to give a slope to all horizontal surfaces, so as to drain all water quickly away. This, on all except exterior surfaces, is toward the interior, whence the water passes down the central well-hole to the level of the ground-surface, and thence by a slope outward to the outside of the foundation.

The shields shown above the lower entrances are to have

land-cement concrete (mixed one of Portland cement to four of trap-rock screenings), which was built up in even courses with the granite and thoroughly bonded with it.

The method of sustaining the statue is shown in the sectional view (Fig. 5) and the plans (Figs. 3-4). The four vertical posts on which the statue is built, and which carry its weight, have broad bed-plates riveted to their feet by means of angles and vertical gussets about three inches thick. The bed-plates rest directly upon two steel girders four feet three inches deep, with the top surface practically level with the top of the pedestal. These are assisted by two similar ones crossing them underneath at right angles. Each girder is made up of three made I-beams thirty-four feet long, with web 51x¾ inches, and angles 4x5x¾ inches. These are joined across the ends by plates 3'5"x3'½", also by various connecting-plates at top and bottom. There are vertical angle-stiffeners 4x4x½ inches at ends and under the posts. The upper and lower girders are joined by ½-inch gusset-plates and by screw-bolts. Each post is secured to the girders by three screw-bolts 5½ inches in diameter, which pass up through the two sets and the bed-plates and are tightened by nuts above. The

shall have an elastic limit of 35,000 pounds, an ultimate strength of 75,000, and a stretch of twenty-five per cent.

We come finally to the statue and its internal framing. The exterior envelope forming the figure is of sheet-copper ⅜-inch thick. This is separated into pieces of convenient size for handling and shipping. The joints are made, as far as possible, non-continuous—that is, with broken joints—and are either lapped or flush. The exteriors of all rivet-holes are countersunk, and only copper rivets, ⅜-inch to ½-inch in diameter, are used. Lap-joints have but one row of rivets, and flush-joints two rows, with an internal cover-strip. For stiffness a series of both horizontal and vertical ribs (see Fig. 7) traverse the copper-work internally. These are of 2x¾-inch iron, follow the bends of the statue at distances of about three feet to four feet, and are made continuous throughout.

They are made up in pieces corresponding to the several pieces of the copper-work (but the joints do not usually correspond with the joints in the copper), and are connected by splicing pieces, each attached by four ½-inch tap-bolts. The copper plates are attached to them by copper straps passing over them and riveted to the plates at each side.

All surfaces of contact of iron and copper are shellacked, and strips of asbestos interposed to prevent the possibility of galvanic action. The several pieces of the ribs were attached to their respective parts of the statue before shipment, and served to prevent deformation in transit.

The principal dimensions of the statue are as follows:

	Feet.	Inches.
From bottom of plinth to top of torch.....	151	5
From heel to top of head.....	111	0
Height of head.....	13	6
Width of eye.....	2	4
Length of forefinger.....	7	11
Length of nose.....	3	9
Size of finger-nail.....	10	$\frac{1}{4}$ x $13\frac{3}{4}$
Total height top of torch above low water....	305	0

The bottom of the plinth starts at eight inches above the masonry of the pedestal, this space being left for ventilation. A light interior lattice of iron runs entirely around it on the interior (see Fig. 7), the verticals of which extend to the masonry as supports. Midway between these there will also be supports of concrete.

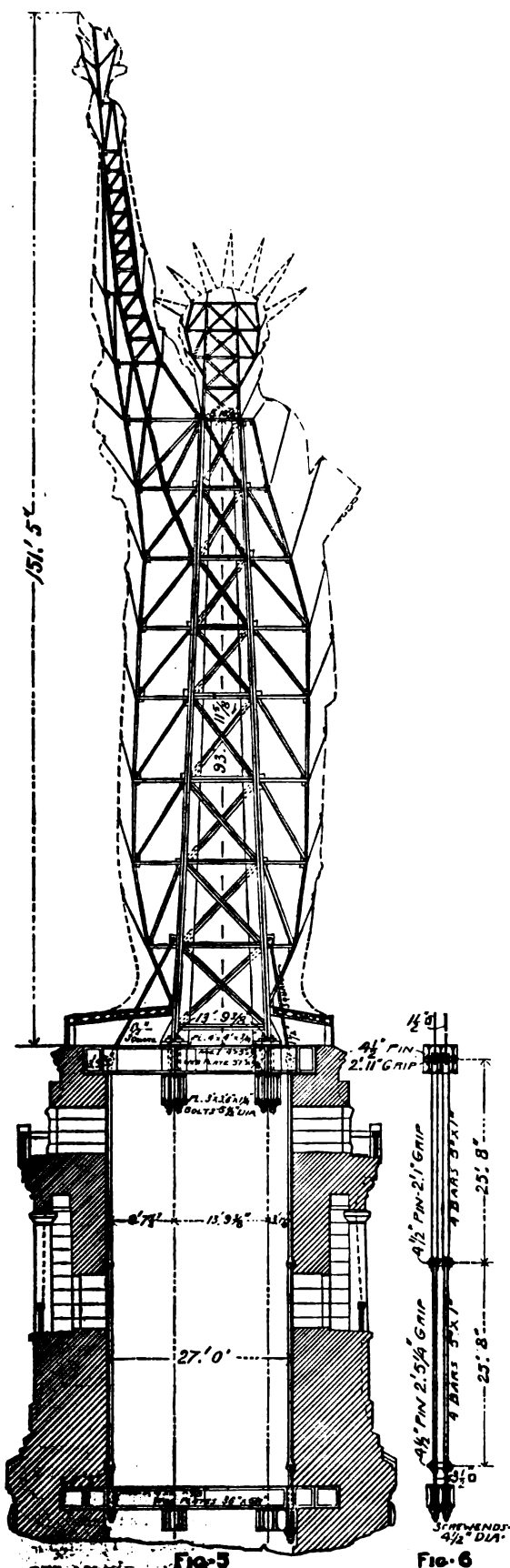


Fig. 5

The lower edge of the plinth has a horizontal extension inward of about a foot for stiffness and as a weather-guard. There is also a ribbed copper covering to the upper surface of the masonry, and a vertical ledge of metal all around near the inner edge for a like purpose. Light trusses extend from the lattice mentioned to the main supporting posts (Fig. 5), and these are joined by others which take the place of the angle-iron rings mentioned hereafter.

The posts are so placed that at their base their outer angles form a rectangle 13 feet $9\frac{3}{4}$ inches by 17 feet $4\frac{5}{8}$ inches, and their tops form a rectangle 5 feet $10\frac{3}{8}$ inches by 7 feet $2\frac{3}{4}$ inches, their height being 93 feet $11\frac{3}{4}$ inches. This height is divided into eight bents by vertical bracing and horizontal struts. At each bent horizontal struts extend to an irregularly formed horizontal ring of angle-irons, at no point more than about four feet, and from that to one foot from the copper covering. This ring is supported also by inclined angle-iron ties, and stiffened by vertical angles as shown in Fig. 5. The rings serve to transmit the weight of the statue to the supporting posts by means of supporting struts of flat iron from each vertical rib to each ring (Fig. 7). These are inclined outward at an angle of about thirty degrees, and attached by screw-bolts. All the work otherwise is riveted work, and proportioned by the French engineers to resist a wind-pressure of fifty-eight pounds per square foot. The work is, however, to be strengthened so as to be safe against a wind of 100 pounds per square foot. This pressure is transmitted to the lowermost sets of girders by the tie-rods, and two small inclined ties from each post assist in transmitting it to them. The frame-work is continued up through the arm and hand, and also into the

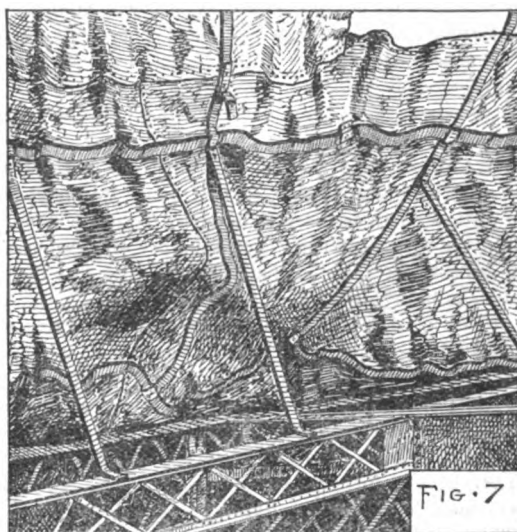


Fig. 7

head, and all parts are made accessible. The diadem will be fitted with sashes, heavily glazed, and made to open when it is desirable.

An engine and dynamo will be fitted up in one of the bomb-proofs of the fort, to furnish electricity to at least a 48,000-candle power light in the torch, and to at least 24,000-candle power distributed in such manner as to illumine the figure. A cluster of fourteen incandescent lights of 50 candle-power each will also be visible in the diadem. The light in the torch will not be seen directly, but strong beams will be projected against the sky and reflected from thence in all directions.

As a protection against lightning, wells were sunk below the foundation, and openings left in the concrete as it was built up, and five copper rods, each three-quarters of an inch in diameter, were sunk several feet into the water in these wells. The rods were carried up through the interior to the statue in lengths of about thirty feet, made continuous by screwing the ends at junctions into copper disks, and joined to the statue for some twelve feet of their length by soldering.

The iron-work of the statue, aside from the steel girders and bars, weighs 400,000 pounds, and the total weight coming on the girders is about 260 net tons. The foundation mass of beton was put in by Messrs. Drake & McGaw, as contractors. The pedestal was built by D. H. King, Jr., who is also erecting the statue. The steel-work for supporting the statue was manufactured by the Keystone Bridge Company.

It is announced that the public dedication of the work will take place on the 28th inst.

THE TUNNEL UNDER THE RIVER MERSEY AT LIVERPOOL.*

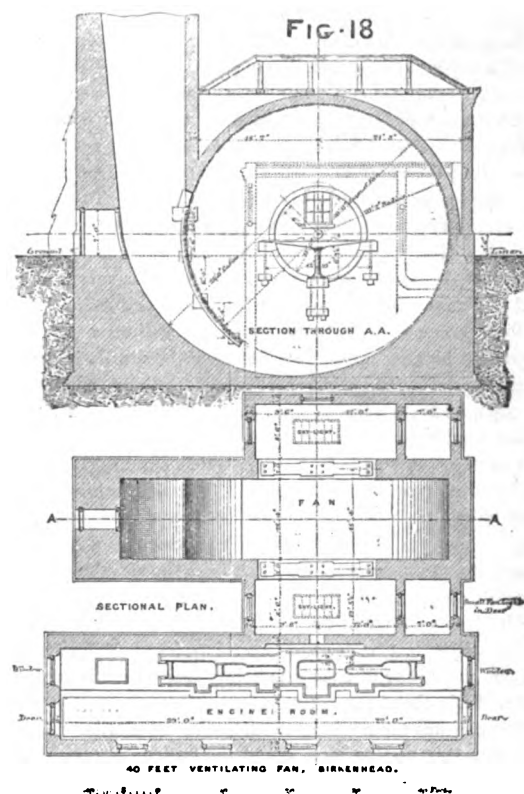
No. III.

(Continued from page 467.)

FIGURE 18 gives a vertical section and sectional plan of the ventilating-fan employed at Birkenhead, and Fig. 13 shows the ventilating heading.

The ventilation of the tunnel and of the stations has been the subject of much consideration. In the ventilation of mines the great aim of the mining engineer is to secure a constant current of fresh air in given directions, and to insure this, all the roadways and workings, which branch off from the main air-ways, are either supplied with double doors, or are stopped by being bricked up and plastered over. In the Metropolitan and Metropolitan District Railways holes have been cut in the roof of the tunnel communicating with the outer air. Through these holes the products of combustion are doubtless to some extent expelled and fresh air is drawn in, but, in the absence of a complete system of mechanical ventilation, the result cannot be satisfactory.

The only practical method of dealing with the impure air in such cases is, in the author's opinion, the adoption of ventilating-fans placed about midway between the stations, by which a steady and continuous current of fresh air will flow in at each station, and thence through the tunnel to the fan. The air throughout the tunnel is thus changed, and not merely churned backward and forward.



The principle laid down for the ventilation of the Mersey Tunnel was that fresh air should enter at each station and "split" each way into the tunnel. By this means the atmosphere on the platform is maintained in a condition of purity. The air has then to travel toward a point midway between the stations, whence it is extracted from the tunnel by means of the ventilating-fans.

The first point to arrive at was the quantity of air required. Taking the consumption of fuel at forty pounds of coal per mile, the service of trains at five-minute intervals in each direction, equivalent to one train passing every $2\frac{1}{2}$ minutes, the greatest distance between the stations as a little over one mile, and the quantity of noxious gas eliminated at twenty-nine cubic feet per pound of coal, the result is 464 cubic feet of noxious gas generated per minute. This, diluted to the extent of 1 in 500, would require 232,000 cubic feet of fresh air per minute to be drawn from the tunnel, or an average duty of 116,000 cubic feet per minute by each of the two fans hereafter described.

The air-drift was cut by the Beaumont boring-machine, and is circular in form, seven feet four inches in diameter, and almost as true and smooth as a gun-barrel. It extends a length of about 2,250 yards, and is connected by means

*"The Mersey Railway," by Francis Fox, M. Inst. C. E.; and "The Hydraulic Passenger-Lifts at the Underground Stations of the Mersey Railway," by William Edmund Rich, M. Inst. C. E.

of sliding doors with the tunnel and the stations, so that the air can be extracted from any point desired.

ENGINES AND FANS.

The fans are somewhat similar to the well-known Guibal fans, excepting that in the shutter (to which Guibal attached the chief value of his patent) an important alteration has been made. With the Guibal shutter the top of the opening, into the chimney from the fan, has a line parallel to that of the fan-shaft and of the fan-blades, and as a consequence, as each blade passes the shutter, the stoppage of the discharge of the air is instantaneous, and the sudden change of the pressure of the air on the face of the blade whilst discharging, and the reversal of the pressure due to the vacuum inside the fan-casing, causes the vibration hitherto inseparable from this type of ventilator.

Immediately at the opening into the chimney (*i. e.*, at an angle of forty-five degrees from the horizontal line), this regulating-shutter, which has a Λ -shaped opening into the chimney, commences, and tapers to a point near the cross-girder which supports the chimney. The result of this gradually decreasing opening is to allow the air to pass in a continuous stream into the chimney, instead of intermittently, as was formerly the case, and to allow the change of pressure from the front to the back of the blade to be imperceptible, the action of the fan being thus rendered noiseless, and with an entire absence of vibration. To suit the varying circumstances under which fans have to work the apex of the Λ can be raised or lowered.

As an illustration of the effect of the pulsatory action of the Guibal shutter, a fan having ten arms and running, say, sixty revolutions per minute, and working twenty-four hours per day gives $(10 \times 60 \times 60 \times 24 =) 864,000$ blows per day transmitted from the tip of the fan-vanes to the fan-shaft; the shaft is thus in a constant state of tremor, and sooner or later reaches its elastic limit. The consequent injury also to the general structure of the fan is obvious. The regulating-shutters are practically indestructible, being of wrought-iron plates, made very strong, and stiffened where necessary with angles and T-irons.

The action of this patent regulating-shutter has an important bearing upon the working of the ventilating-fans in their consequently increased durability and efficiency. In towns, like Liverpool and Birkenhead, any pulsatory action would be readily felt by the inhabitants. It is difficult to detect any sound whatever when standing close to the buildings containing the fans. The air is admitted on both sides, as it is found in practice that the fans run much more smoothly, and with the absence of the side thrust attendant upon those which have the air admitted on one side only.

The fans are four in number, two are forty feet in diameter by twelve feet wide, and two thirty feet in diameter by ten feet wide, one of each size being erected at Liverpool and at Birkenhead respectively.

The engines for working the fans are all similar in design and construction, and are of the horizontal type, each fan having a compound tandem condensing-engine with a horizontal condenser, and also a simple high-pressure stand-by engine, coupled direct to the fan-shaft; a very short time only is required to change from one engine to the other. For the 40-feet fans the high-pressure and low-pressure cylinders of the compound engine are twenty inches and thirty-three inches in diameter respectively, by two feet six inches length of stroke. The stand-by engine has a cylinder thirty-three inches in diameter by two feet six inches length of stroke. The engines of the 30-feet fans have, for the compound engines, high-pressure and low-pressure cylinders, fifteen inches and twenty-four inches in diameter respectively, by two feet length of stroke. The stand-by engine has a cylinder thirty-four inches diameter by two feet length of stroke.

As water for condensing purposes is not readily available for the fan erected in Hamilton Street, Birkenhead (Fig. 1), the exhaust steam is cushioned, and rendered noiseless by being turned into a receiver before passing into the atmosphere, but advantage is taken of this by placing, inside the receiver, a water-heater, through which the feed-water for the boilers passes.

Each fan is supplied with a Harding's counter, worked by means of an eccentric on the fan-shaft, a steam-pressure gauge, a vacuum-gauge, and a water-gauge, the latter having a communication with the fan-drift by means of a short pipe. The engines throughout are made very strong, and careful attention has been paid to every detail, so that

any accident thereto is of very unlikely occurrence. An overhead traveler is fixed over each fan-engine.

For the purpose of ventilation the tunnel is divided into four sections, one of the above fans being allotted to each, but two fans at Liverpool and one fan at Shore Road, Birkenhead, can at any moment, through the medium of doors in the air-headings and passages, be made to do each other's duty as well as their own, and by this means any complete stoppage in the ventilation of the tunnel is rendered impossible.

The 30-feet fan erected at Liverpool ventilates through the medium of a portion of the air-heading, the James Street station (connections being made from the roof of that station to this air-heading) and also the section lying between the said station and the terminus. This fan exhausts about 120,000 cubic feet of air per minute.

The 40-feet fan erected in Liverpool ventilates the section of the tunnel lying between the James Street station and the centre of the river, there being "smoke-holes" at intervals between the main tunnel and the air-heading. This fan exhausts about 130,000 cubic feet of air per minute.

The 40-feet fan at Shore Road does similar duty to the 40-feet fan working at Liverpool, and ventilates the section lying betwixt the middle of the river and the Hamilton Square station at Birkenhead, there being "smoke-holes" also connecting the main tunnel and the air-heading. This fan, in addition, will ventilate the Hamilton Square station by means of "smoke-holes" in the roof which are connected with the fan by a separate air-way. The air exhausted by this ventilator is about 130,000 cubic feet per minute.

The fourth fan, of 30-feet diameter, exhausting about 200,000 cubic feet of air per minute, is erected in Hamilton Street, nearly midway betwixt Hamilton Square station and Borough Road station. This fan is connected directly to the main tunnel by a shaft twelve feet in diameter, and a cross-cut at the bottom of the shaft to the tunnel of similar sectional area, and ventilates the tunnel between the two stations above named.

The fresh air enters through the respective stations as well as through the entrances to the tunnel, but to relieve the stations from too strong draughts the two pumping-shafts, the one at Liverpool and the other at Birkenhead, are also used for the admission of fresh air, the quantity of which can be regulated.

At each of the "smoke-holes" connecting the stations and main tunnel with the air-heading, doors are placed for regulating the volume of air passing through.

The total yield of the four fans amounts to 580,000 cubic feet of air per minute, or about one-seventh part of the total cubic capacity of the tunnel. There is a considerable margin between the duty of the fans as given above, and their maximum exhausting capacity.

The ventilating-fans and fan-engines were made and erected by Messrs. Walker Brothers, of Wigan, and the shutter already described is their patent.

The figures given above aggregate 580,000 cubic feet per minute as a total yield of the fans. Preliminary experiments with the fans gave 651,420 cubic feet, and the interesting fact was developed that through the circular heading having an area of forty-one square feet and with a water-gauge of $2\frac{1}{2}$ inches, the air attained a velocity of nearly 3,300 feet per minute.

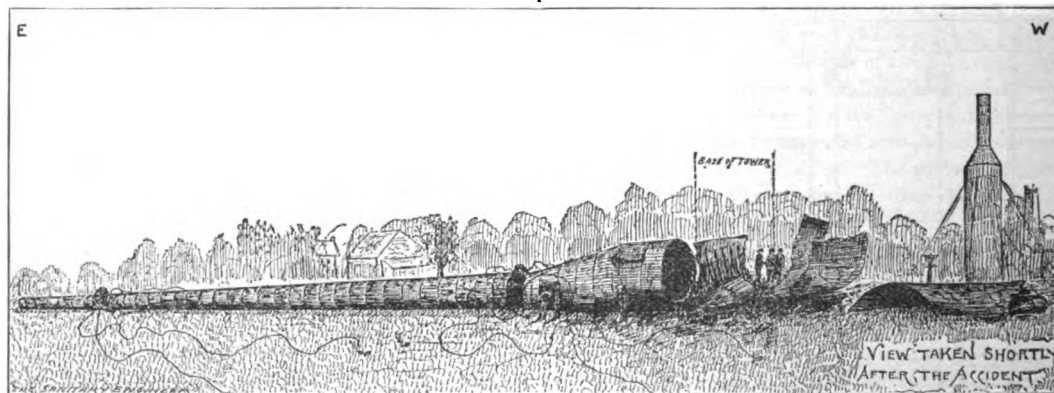


FIGURE 7.

Mr. Shelford spoke of smoke clinging to the roof of a tunnel, but thought from modern practice that it was no longer thought necessary to leave a space for its accumulation.

Captain Galton suggested the power of the train itself to ventilate, instead of mechanical fans, in a short tunnel, by

dividing the tunnel by a diaphragm, and so making each train act as a piston to drive out foul air and draw in fresh.

Mr. Fox said the "loop-heading," previously mentioned as for drainage, served also for ventilation by means of the smoke-holes joining it with the tunnel (see Fig. 1). The system was that the air should enter at the station, and then divide, one-half going each way, so that the products of combustion were immediately swept into the tunnel and the platform kept clear. The air traveled to the centre of the tunnel and was drawn out through the ventilation heading by the 40-feet fan. The 30-feet fan ventilated the land portions of the railway.

Doors were placed between the fans, so that should one get out of order, by throwing them open the other could ventilate both sections.

The products of combustion from a standing locomotive were immediately swept away by the 30-feet fan.

Mr. J. Barry took exception to the statement that the ventilation through holes in the roof of the Metropolitan roads were not effective. He said in the case of the ten ventilators on the District Railway there was a total in-draught of 392,000 cubic feet of fresh air, and an expulsion of 432,000 feet of foul air per train (the rest coming in through the mouths of the tunnel), and the air was changed once for every $4\frac{1}{2}$ trains that passed. The gas given out by all these was equivalent to about 21 parts in 10,000, which was about the standard of purity reached in the Mersey Tunnel. Before the ventilators were made the impurities reached 56 parts in 10,000. He did not think if the number of trains were doubled the ventilators would be equally effective, because the fouling would increase faster than the in-draught of fresh air. As to vegetation and foliage of trees being injured by the gases, it was found not to be the case, and they had not proved offensive to passers by. His experience had been that any system of ventilation of long tunnels is liable to be upset by a strong wind, as it would at times render the action of a fan almost migratory, and in long single-line tunnels the air became so foul as to be almost insupportable.

Mr. Baker said the dipping gradients between stations made the Mersey Tunnel very favorable for ventilation, since they did much of the work of the engines, and therefore lessened the coal consumption.

To the suggestion of Captain Galton, that a double tunnel would be more favorable for ventilation, Mr. Fox said the cost would have been greatly increased, and he considered mechanical ventilation desirable for either a single or a double line if it is to be made efficient.

[Our next article, which concludes this series, will describe the hydraulic lifts.]

(TO BE CONTINUED.)

THE BURSTING OF THE GRAVESEND WATER-TOWER.

THE new stand-pipe of the Kings County Water-Supply Company, just erected under contract of the Robinson Boiler-Works, of Boston, was located near the company's pumping-station and wells at the crossing of the Neck Road and Brighton Beach Railroad, Sheepshead Bay, Long Island.

On October 7, while it was being filled and tested preparatory to turning it over to Mr. B. F. Stephens, Presi-

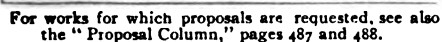
dent and Superintendent of the Kings County Company, the tower burst near the bottom and fell to the ground a wreck. The pressure-gauge in the engine-house, it is stated, registered at the time 100 pounds. The pumps lie about 15 feet below the base of the tower. The stand-pipe was circular, 250 feet high, of steel plates; was

OF

DEVOTED TO

A JOURNAL FOR THE ARCHITECT, ENGINEER, MECHANIC, AND MUNICIPAL OFFICER.

[NUMBER 21]



TORONTO, ONT.—The Water-Works Committee of the City Council have appointed a sub-committee consisting, of Aldermen Hunter and Galley and Chairman Walker, to select a competent engineer to make a thorough examination of the new pumping-engine. Mr. Charles Sproatt, City Engineer, has recommended the laying of a new 5-foot iron conduit across the bay to connect with a 6-foot wooden conduit running out into the lake. The cost of this proposed work would be about \$280,000, Superintendent Hamilton's estimate being \$276,600, and that of the City Engineer \$281,305. It was decided to refer the matter to the council with a report recommending that the work be done.

NEW ORLEANS, LA.—The City Council, by a vote of 17 to 4, have decided that there is no ground on which the forfeiture of the charter of the Water-Works Company can be justly demanded.

KANKAKEE, ILL.—The new water-works tower, made of boiler iron, 125 feet high and 20 feet across, completed last week at a cost of \$15,000, was blown down on October 14.

CARLYLE, ILL.—The bid of the Interstate Gas Company of St. Louis to erect and maintain a system of water-works for that city has been rejected, and the City Council has passed an ordinance to build the works. Bids were opened and considered at the meeting of the council October 21. The plan and specification contemplate the laying of nearly four miles of main, about seventy-five plugs, besides fountains and watering-places for stock.

MILWAUKEE.—The Board of Public Works asks for \$2,000 to build a protecting pier for the South Side Pumping-Station, on Jones' Island, for the intercepting sewerage system. The main sewer in Reed Street is being connected to the large intercepting-sewer. This will be the first sewer connected.

DE LAND, FLA., recently voted to have water-works.

ORLANDO, FLORIDA, recently voted to have the town supplied with water-works.

MINNEAPOLIS, KANSAS, is about to build water-works, and proposals are asked to be sent to the City Clerk until November 8.

NORTHBORO, MASS.—The water-works system of this town will probably be enlarged shortly. The supply will probably be taken from Lake Chauncy, and the plan will probably require a pumping-station, the lake being lower than the village, although it is possible that the dam of the present reservoir may be raised.

ILION, N. Y.—A special election was held on the 16th inst., to decide upon the water-works question. The vote was light. The following are the questions voted upon:

First, "Are you in favor of any system of water-works for the village of Ilion at present?" which was defeated by 49 yeas to 183 nays. Second, "Are you in favor of the village of Ilion granting the right to the Mohawk Valley Water-Works of laying mains and pipes through the streets, alleys, etc., of the village according to a proposed contract?" This proposition was also defeated by a vote of 32 yeas to 108 nays.

LOUISIANA, Mo.—The City Council has awarded the contract for building the water-works to Bronson & Forster, of New York City, subject to a popular vote at a special election to be held on the 25th of this month. The ordinance provides that the firm shall supply water for a term of twenty years, and that the city is to have the privilege of purchasing the works at the end of ten years. Two pumping-engines, with a capacity of 1,500,000 gallons every twenty-four hours, will be used. There will be six miles of pipe, varying in size from four to twelve inches, and forty-one hydrants. It is expected that the people will indorse the action of the City Council.

HUNTINGTON, W. VA., is mooted the question of a town water-works of a capacity of 3,000,000 gallons per day. Mr. J. H. B. Davenport and others, who built the Charleston Water-Works in Kanawha County, have made the City Council a proposition to build works and supply the city with water on the condition that the city grant the exclusive privilege of its streets for laying main pipe, etc., for thirty years, and that it will agree to take twelve hydrants for each mile of main laid, paying \$40 each for same annually. Public schools and public buildings to be supplied with water free of charge. The city to have the privilege of buying the water-works at the end of two years.

LEBANON, PA.—Mayor Hoffer sent a special message to councils advocating measures to secure an increased water supply. New waterworks, not to exceed \$200,000 in cost, are recommended, and a competent engineer will be employed shortly to make the necessary examination of near-by sources.

BALTIMORE, MD.—The following bids for the construction of the reservoir for the Union Bridge Water Company were opened at 12 M. Thursday, October 14: Conway & Botts, Baltimore, Md., \$2,100; F. H. Thomas, Shippensburg, Pa., \$2,250; David G. Ogle, Union Bridge, Md., \$2,235; J. W. Ogle and L. W. Smith, Union Bridge, Md., each \$2,300; John Donoghue, Emmittsburg, Md., \$2,700; O. Patterson, Baltimore, Md., \$3.035; David Utz, Union Bridge, Md., \$2,857. The contract has not yet been awarded. The construction of the reservoir will be under the direct supervision of E. D. Crook, engineer, of the firm of Crook, Horner & Co., who are furnishing and laying the mains, fire-plugs, and the Worthington compound duplex steam-pump, capacity 500,000 gallons per day.

TARENTUM, PA.—The new opera-house, to cost \$35,000, after plans by Mr. T. D. Evans, architect, Pittsburg, is in course of construction. The contract for plumbing and gas-fitting has been let to Cutter & McFadden, of Pittsburg, for \$2,500.

MEXICO.—A system of sewers is to be built in the city of Mexico at a cost of about six millions of dollars, three and one-half millions of which will be used in tunneling through a mountain, a distance of six miles long, to convey the sewage of the city to the mouth of the tunnel.

CLEVELAND, O.—The following bids for pumping-engines were received by Cleveland Water-Works, October 15, 1886 :

BIDDERS.		Duty Guaranteed.	Price, one engine.	Price, two engines.	Price for one engine.	Price for two engines.
Knowles Steam-Pump Works, New York City.	48" stroke.	60 M	48" stroke.	48" stroke.	60" stroke.	\$99,000
Holly Manufacturing Co., Lockport, N. Y., (1)	60 M	63 M	\$63,000	\$79,000	\$55,000	
" " " " " " " "	95 M	"	66,000	130,000	"	
" " " " " " " "	86 M	"	138,000	70,000	"	
" " " " " " " "	68 M	"	42,000	80,000	"	
" " " " " " " "	90 M	"	62,000	122,000	"	
" " " " " " " "	90 M	"	85,000	160,000	"	
E. H. Martin, Cleveland, O.,	85 M	"	51,850	100,000	"	
Gordon Maxwell, Hamilton, O.,	50 M	"	55,000	105,000	"	
Henry R. Worthington, New York City, (1)	55 M	"	34,000	68,000	"	
" " " " " " " "	60 M	"	36,000	72,000	"	
" " " " " " " "	(3)	"	59,850	118,000	"	

Worthington adds to his proposals Nos. 1 and 2 for patent cut-off on high-pressure cylinder and patented intermediate sleeve between separated cylinders the sum of \$4,000.

MILWAUKEE.—Pipe-sewers, contracts let October 12, 1886: Richard Street (North Avenue to Lee Street), \$2.10 per foot; Thirty-fourth, from Cedar Street to Edgewood property, \$1.67 per foot; Eighth Street, from Lee Street to North Avenue, \$1.60 per foot.

DETROIT, MICH.—Joseph Hobson, of Hamilton, Ont., is Chief Engineer of the Canadian corporation named the River St. Clair Tunnel Company and the United States corporation named the Port Huron Tunnel Company, which are conjointly building a tunnel through the Detroit River, which is to cost \$1,500,000. Both these companies will shortly be amalgamated. The tunnel will be a mile long, of which 2,300 feet will be under the river; 1,160 feet under the ground in Canada, and 1,800 feet under the ground on the American side. The tunnel is to be built of brick, with walls thirty inches thick.

BROOKLYN, N. Y.—The contract for building sixteen cottages for the insane asylum has just been awarded to James W. Birkett, of Brooklyn, at \$114,000; the contract for engines and boilers to Smith & Bros., at \$8,500. Bids were received from John Lee, for cottages, \$126,440, and for engines and boilers, \$9,000; also, from H. D. Southard for the entire work, \$134,419.

SACRAMENTO, CAL.—The Board of Supervisors have passed a resolution ordering the construction of a new bridge across the Cosumnes at Michigan Bar, and proposals will shortly be advertised for. Messrs. Carle

& Croly submitted plans, which were adopted, and the firm was directed to make out specifications.

ST. PAUL, MINN.—The Bohn Manufacturing Co. (sash, doors, and blinds), are building a \$45,000 3-story brick manufactory on their grounds in East St. Paul.

SOUTH ROYALTON, VT.—The Central Vermont R. R. Co. purpose building a brick passenger and freight depot at this place, to cost between \$8,000 and \$10,000.

TREMONT, MASS.—Messrs. G. C. & H. P. Tobey, of Wareham, contemplate erecting a mill at this place for a \$300,000 Bessemer steel plant for the manufacture of steel nails by the Bessemer process exclusively.

CHICAGO, ILL.—An elevated railroad is projected, running through Hyde Park to Kensington. A portion of right of way has been secured. The engineer and manager of the company is Col. Howard Ellis.

CAMBRIDGE, MASS.—It is reported that a cable railway is to be built connecting Somerville and Cambridge with Boston and each other. Henry Root, engineer of the San Francisco cable road, has been here looking over the ground, and Mr. Preston Cummings, President of the Cambridge Railroad, with two of the directors are now in Chicago examining the cable railway.

SACRAMENTO, CAL.—A standard gauge railroad is to be constructed from the city of Santa Rosa, through the Guillocos and Sonoma Valley to the city of Benicia, Cal., connecting with the general railroad systems of the State. The estimated length of the projected road is about 50 miles. The company has just been formed with \$1,000,000 capital, with headquarters at Santa Rosa. The directors are: John Walker, Sebastopol; Thomas J. Proctor, James B. Rue, George P. Noonan, and William H. Orr, of Santa Rosa.

NEW YORK.—A syndicate is formed for the purpose of building a line of railroad on the south side of Lake Superior from Duluth, Minn., by way of Superior and Ashland, Wis., and Marquette, Mich., to Mackinaw and Sault Ste. Marie, and by a bridge over the Sault connecting the Grand Trunk and Canadian Pacific Railroad. The length of the proposed road is to be 455 miles, including a branch of 50 miles to Mackinaw. It is stated that the money has all been subscribed. Further information may be obtained of Calvin S. Brice, 10 Wall Street.

KANSAS CITY, MO.—Work is about to be commenced upon the Milwaukee and St. Paul Railroad Bridge at Randolph Bluffs. The contracts were recently let in Milwaukee, the construction of the piers being awarded to Sooy-smith & Co., of New York, and that of superstructure, for three 400-foot spans across the main river, to the Keystone Bridge Co., of Pittsburg, and the contract for 1,545 feet of iron trestle-bridge was let to Mr. Lessig, of Chicago. The two contracts amount to \$700,000. Mr. J. E. Willard, representing Sooy-smith & Co., is now here receiving bids for stone contracts. The work is to be begun at once. The contract calls for the completion of the substructure in April next. The superstructure is to be completed July 1, 1887.

SAN FRANCISCO, CAL.—The following were the bids for the reconstruction of Fillmore Street bridge: San Francisco Bridge Co., \$9,987; David Finlay, \$10,437; J. P. Engle, to whom the contract was awarded, \$6,995.

MEMPHIS, TENN.—The contract for the new court-house fence was let to the Champion Fence Co., of Canton, O., who are to furnish 3½-inch fence for seventy-one cents per foot. The amount of fencing required will be about 600 feet, without the gates.

WEST CHESTER, PA.—It is probable that a new bridge will be built over the Schuylkill instead of purchasing the Royersford bridge. The matter is in charge of Messrs. Beerbower and Surveyor Bertolet.

CHICAGO, ILL.—The city awards contracts for iron-work in the addition to the House of Correction, to cost \$150,000, as follows: Parker & Wilkinson, \$9,430; Jones & Loughlin, of Pittsburg, \$9,032; S. D. Kimbark, of Chicago, \$2,025.

NEW JERSEY.—The contract for construction of life-saving station at Townsend Inlet, N. J., has been awarded to H. Morrison, of Camden, at \$4,400.

The contract for moving life-saving station from Holly Beach to its new site has been awarded to Messrs. Williams & Cassidy, of Cape May.

ST. PAUL.—The following proposals have been received by the City Council for steam-heating at City Hospital: Duane Iron Co., \$5,350; E. F. Osborne, \$5,46.76; Hoiland & Thompson Mfg. Co., \$5,597. Proposals for an additional building at the City Hospital: E. N. Carrier, \$4,250; William Lettau, \$3,924; Dowling & Ruse, \$4,254.15; Pennsylvania Slate Co., for slate, etc., \$298.40. Referred to appropriate committees.

LONG BRANCH, N. J.—A scheme is on foot and application has been made to the City Council for permission to lay mains through which to supply cottagers with sea-water for bathing.

HARRISBURG, PA.—The Common Council have passed an ordinance granting the right of way to the Harrisburg Steam-Heating Co. through the streets of the city. The company will commence to lay its pipes next week, and efforts will be made to have the works in operation by December 1.

THE FORT PITT (MINN.) Iron and Steel Works are erecting 3 furnaces for the manufacture of sponge iron from raw ore. It is the intention of the company to erect seven more furnaces shortly.

STEEL LIGHT-SHIPS.—Proposals will be received until twelve o'clock on November 15, for furnishing materials and labor necessary to construct two steel light-ships, by Admiral S. C. Rowan. Further information may be obtained from Lighthouse Board, Washington, D. C.

ST. PAUL, MINN.—The St. Paul Heat and Power Company, with \$500,000 capital, has been formed to bore for natural-gas six miles from St. Paul, the intention being to pipe the gas to Minneapolis and St. Paul. Work begins about October 19, \$10,000 to be invested in boring. It is expected gas will be found at or before 3,000 feet. Secretary, S. E. Dawson, St. Paul.

The Board of Education have let the contract for plumbing the Jefferson High School buildings to J. J. Dunnigan, at \$2,397. Also, contract to J. C. Johnson, plumbing Madison School, at \$4,270. The contract for laying cement tile pavement in front of the Neill, Washington, and Franklin Schools has been let to The Portland Stone Co. for \$1,008.

MILWAUKEE, WIS.—The following bids on steam-heating in the new County Jail were opened October 12: C. A. Barker, \$5,643; H. Mooers, \$5,761; J. P. Rundle, \$5,797; M. Coogan, \$5,835. The committee to report October 26.

DETROIT, MICH.—Architect Gordon W. Lloyd is at work on plans for a new Homoeopathic Hospital in this city, for which Mr. James McMillen and Mr. John S. Newberry have each given \$100,000. The building is to be four stories high, the first story being of rough cut stone, and the remaining stories of brick, with cut-stone trimmings. Mr. Lloyd and Dr. C. A. Walsh have visited the leading hospitals and asylums of the country with the idea of combining the best ideas. It is intended to erect a garbage-burner in the basement.

An ordinance was introduced in the Select Council at Philadelphia, October 7, granting permission to the Metropolitan Railroad Company to construct, under certain streets, an underground railway system. The company promises that the motive power will be free from smoke, gas, or cinders, and it is thought that the soda-motor will be employed. The

cars and subways are to be lighted by electricity, and the coaches will have a seating capacity of thirty-five persons. The rate of speed will be from thirty to forty miles an hour. The charter has already been granted, and the capital stock is \$2,250,000.

PROPOSALS for erecting buildings for the Toledo Insane Asylum will be received by J. W. Nelson, Superintendent of the Asylum, Toledo, O., until twelve o'clock November 2. The estimated cost based upon land and specifications on file for the inspection of bidders is \$33,145.75.

GRANOLITHIC PAVEMENT.—Proposals will be received until October 30 for furnishing granolithic pavement in rebuilding Court House at Cincinnati, O. For particulars address J. Clifford Gould, Clerk, Cincinnati, O.

BUILDING SEWERS.—Proposals will be received until October 28 for building the Bird Avenue connection of the Buffalo trunk-sewer. For further information address D. C. Beard, Chairman, Buffalo, N. Y.

GOVERNMENT WORK.

BOSTON, MASS.—The following bids for dredging and removing from channel in Ipswich River, Mass., 6,600 cubic yards material, were received by Major G. L. Gillespie, Corps of Engineers, October 19: Aug. R. Wright, 112 Boylston Street, dredging, 46c. per cubic yard; Boynton Bros., 35 Congress Street, 48c.; Bay State Dredging Co., 76 High Street, 35c.; Thomas Symonds, Leominster, Mass., 31½c. Improving Hingham Harbor, Mass.: Aug. R. Wright, 112 Boylston Street, dredging, 96c. per cubic yard; Boynton Bros., 35 Congress Street, dredging, 92c., removal of rock, \$27 per cubic yard; George W. Townsend, 212 Atlantic Avenue, removal of rock, \$29.

CLEVELAND, O.—The following bids for furnishing and placing rubble stone in foundation for breakwater at Cleveland Harbor were received by Major L. Cooper Overman, Corps of Engineers, October 8: Carlin, Stickney & Cram, East Saginaw, Mich., \$5.90 per cord of 128 cubic feet; L. P. & J. A. Smith, Cleveland, O., \$4.90 (lowest bidder); Robert Greenhalgh and E. B. De Lamater, Cleveland, O., \$5.45; Stang & Gillmore, Lorain, O., \$5.24. Recommend award be made to L. P. & J. A. Smith.

SCHEDULE of proposals for furnishing 4,900 cubic feet of dressed or dimension granite at U. S. Navy Yard, Mare Island, Cal.:

BIDDERS.	Dressed granite per cubic foot.		Dimension granite per cubic foot.	
M. J. Kellev.....	\$2.69		\$2.19	
M. J. Healey & Co.....	2.27		1.27	
Davis Tillson.....	2.70		1.70	
Rodwell Granite Co.....	2.90		1.90	
Mt. Waldo Granite Works.....	2.95		1.75	
James McCudden.....	3.10		2.50	
G. Griffith.....	2.95		2.45	

SYNOPSIS of bids for roofing-slate for various buildings, opened October 9:

BIDDERS.	Lynchburg, Va.		Council Bluffs, Iowa.		Erie, Pa.	
	Rate per 100.	Rate per 100.	Rate per 100.	Rate per 100.	Rate per 100.	Rate per 100.
J. R. Williams & Co.....	\$7.20	\$14.75	\$8.70			
William Williams.....	8.00	12.00	8.00			
R. L. Williams.....	13.00	21.00	13.25			

BALTIMORE, MD.—Synopsis of bids for marble-work of Post-Office, etc., opened October 11: Davidson & Son, \$89,898; Burlington Manufacturing Company, \$95,600; Pickel Marble and Granite Company, \$108,000; Hugh Sisson & Sons, \$96,000; The Green Serpentine Marble Company, \$187,000.

MINNEAPOLIS, MINN.—Synopsis of bids for iron columns, beams, etc., for Post-Office, etc., opened October 12: Herzog Manufacturing Company, \$8,743; Snead & Co. Iron-Works, \$10,400; Dearborn Foundry Company, \$9,400; Marshall Foundry and Construction Company, \$10,716.95; St. Paul Foundry Company, \$8,448; Haugh, Ketcham & Co. Iron-Works, \$10,549.30.

ST. JOSEPH, MO.—Synopsis of bids for columns, etc., first story, and beams, etc., second story, of Post-Office, opened October 13: Ambrose Manufacturing Co., \$7,000; Haugh,

Ketcham & Co. Iron-Works, \$8,167.32; Insley, Shive & Tullock, \$7,609.50; Clark, Raffin & Co., \$7,569; Snead & Co. Iron-Works, \$7,896; Dearborn Foundry Co., \$7,485.

ABERDEEN, MISS.—Synopsis of bids for all brick and stone masonry, iron, wood, and terra-cotta work, plastering, joiner-work, and all interior finish required to complete the building, excepting excavation, concrete footings, box for post-office screen, and plumbing, for Court House, etc., opened October 12: John Moore, \$66,500; Lewis Monnin, \$67,000; Job W. Angus, \$66,500; James H. Coster, first bid, \$60,600, second bid, \$58,800; McCarthy & Corbett, \$54,748; Figh & Williams, \$64,800; S. H. Berg, \$58,200; Oliver Caldwell, \$67,000; Dumesneil & Bros., \$55,150.

ABSTRACT of proposals for constructing a frame storehouse at the U. S. Naval Station, Port Royal, S. C., under advertisement of the Bureau of Yards and Docks of September 11: N. Christensen, \$5,081.

WASHINGTON, D. C.—The District Commissioners opened bids October 14 for the erection of the proposed bridge of stone abutments and iron superstructure across Rock Creek at Klinge Ford. The bidders for the masonry work of the abutments were: Atchison & Lynch, \$4,091.50; J. McKnight, \$5,562.50; Flannery Bros., \$4,969; John Lyon, \$4,174.50. The bidders for the iron superstructure: Pittsburgh Bridge Co., \$2,900; King Iron Bridge Co., \$2,500; and Edgermoore Iron Co. (informal), \$2,815.

WASHINGTON, D. C.—The following is a list of bids received and opened October 15 for gas-piping in third and fourth stories of new Pension Building: John Lyon, \$655.36; William Rothwell, 694; James Ragan, \$683.30—all of Washington. The contract was awarded to John Lyon.

ABSTRACT of bids for rubble stone for the extension of North Jetty at entrance to Newburyport Harbor, Mass., opened by Lieut.-Col. G. L. Gillespie, Corps of Engineers, October 13: Price bid for stone per ton of 2,000 pounds—Newburyport Quarry Company, by Edward P. Shaw, President, \$2.87; Charles H. Edwards, \$2.23, lowest bid.

ABSTRACT of bids for the dredging and removal of 30,000 cubic yards of material from Scituate Harbor, opened by Lieut.-Col. G. L. Gillespie, Corps of Engineers, October 13: Dredging—A. R. Wright, per cubic yard in scows, 41c.; Bay State Dredging Co., 45c.; Boynton Bros., 38c. Blasting—H. W. Phillips, per cubic yard, \$8.50; Boynton Bros., \$15; J. H. Smith, \$11; Green & Ornellas, \$12; G. W. Townsend, \$29.

ABSTRACT of bids for dredging in Lynn and Plymouth harbors, opened by Lieut.-Col. G. L. Gillespie, Corps of Engineers, October 13: Lynn Harbor—Bay State Dredging Co., 30c. per cubic yard; Boynton Bros., 29c.; Augustus R. Wright, 21½c.

Plymouth Harbor.—New England Dredging Co., per C. H. Souther, President, 24c. per cubic yard; Bay State Dredging Co., per A. B. Martin, proprietor, 26c.; Augustus R. Wright, 30c.; Robert Hamilton, Jr., 30c.

ABSTRACT of bids for dredging in Harbor of Refuge, Sandy Bay, Cape Ann, Mass., opened October 12 by Lieut.-Col. G. L. Gillespie, Corps of Engineers: Price bid for stone per ton of 2,000 pounds—Rockport Granite Company, per Charles S. Rogers, Treasurer, Pigeon Hill Granite Company, per F. Scripture, Treasurer, 71c., lowest bid; Charles H. Edwards, 86c.

CLEVELAND, O.—The following bids for furnishing hardware as may be required for use by United States Engineer Office during the fiscal year ending June 30, 1887, were received by Major L. Cooper Overman, Corps of Engineers, October 11: A. T. Osborn & Co., Cleveland, O., iron, tools, hardware, paint, etc., a minority of articles bid upon, \$57.22; McIntosh, Good & Huntington, Cleveland O., \$37.26; majority of articles bid upon \$148.07; J. C. Wilmot, Cleveland, O., minority of articles \$54; The Sturtevant Lumber Co., bid imperfect, not considered. Recommended award be made to Messrs. McIntosh, Good & Huntington.

ABSTRACT of bids for improving Hay Lake Channel, St. Mary's River, Mich., excavating at Middle Neebish, received and opened by Lieut.-Col. O. M. Poe, Corps of Engineers, U. S. A., on October 14, 1886.—Excavating above 20-foot grade, per cubic yard in bank: Henry M. Youmans, East Saginaw, Mich., \$2.50; Hickler & Green, Sault Ste. Marie, Mich., \$2.98; Harkin, Stickney & Cram, East Saginaw, Mich., \$3.20; Charles S. Barker,

Duluth, Minn., \$3.80; L. P. & J. A. Smith, Cleveland, O., \$4; Green Bay Dredge and Pile-Driver Co., Green Bay, Wis., \$4.05; Williams, Upham & Co., Duluth, Minn., \$4.50; George Talbot, Buffalo, N. Y., \$5; Truman & Cooper, Manitowoc, \$6.50.

BURLINGTON, VT.—The following bids for furnishing 16,665 cubic yards of rubble stone and 5,500 cubic yards of large stone were received by Major M. B. Adams, U. S. Engineers, October 15:

BIDDERS.	Rubble stone, 16,665 cubic yards.		Large stone, 5,500 cubic yards.		Piles and round timber 1,089 linear feet.	Bolts, spike, and iron, 830 pounds.	Total.
	cu. yd.	cu. yd.	cu. yd.	cu. yd.	lin. ft.	per lb.	
Richard Fenner Hawkin, Springfield, Mass.....	\$3,105.34	\$3,105.34	\$3,105.34	\$3,105.34	\$3,105.34	\$3,105.34	\$3,105.34
Francis H. Smith, 16 and 18 Exchange Place, N. Y.....	\$3,105.34	\$3,105.34	\$3,105.34	\$3,105.34	\$3,105.34	\$3,105.34	\$3,105.34
John L. Johnson, Fulton, Oswego County, N. Y.....	\$3,105.34	\$3,105.34	\$3,105.34	\$3,105.34	\$3,105.34	\$3,105.34	\$3,105.34
David White, Rouse's Point, N. Y.....	\$3,105.34	\$3,105.34	\$3,105.34	\$3,105.34	\$3,105.34	\$3,105.34	\$3,105.34

ABSTRACT of proposals for building cribs and rip-rapping, at Battery Island, head of Chesapeake Bay, opened at 12:05 P. M., October 11, 1886, by Lieut.-Col. William P. Craig-hill, Corps of Engineers, U. S. A.:

Approximate Quantities.	Price	Amount.	Price	Amount.	Price	Amount.	Price	Amount.	Price	Amount.
150,000 feet Georgia pine timber, in place, per 1,000 feet B. M.	\$49.00	\$7,350	\$60.00	\$9,000	\$32.00	\$5,100	\$4.80	\$1,440	\$4.80	\$1,440
150,000 feet white oak timber, in place, per 1,000 feet B. M.	74.00	11,100	90.00	13,500	38.00	5,700	3.00	900	3.50	1,050
1,200 locust tree-nails, in place, per 100	5.00	600	50.00	720	3.00	360	3.50	420	6.00	720
1,500 perches stone filling, in place, per perch	2.94	4,410	4.40	6,600	2.87	4,305	4.10	6,150	2.60	3,900
1,500 perches stone rip-rap, in place, per perch	2.94	4,410	4.40	6,600	2.75	4,125	4.125	6,187.50	2.49	3,735
5,000 pounds iron (spikes, ties, bolts, etc.), in place, per pound	2.40	12,000	4.40	22,000	2.75	13,750	4.125	20,625	2.49	12,450
Total bid		\$16,530		\$22,917		\$13,391		\$20,625		\$12,450

All rejected, prices too high.

NEW ORLEANS, LA.—The following bids for construction and repairs of jetties were received by Major W. H. Heuer, U. S. Engineers, October 9:

<p style="text-align: center;">BIDDERS.</p>	
<p>A. M. Shannon & Co., Galveston, Tex.....</p> <p>Peter Burke, William Fagan, Robert A. Wilson, New Orleans, La..</p> <p>Louisiana Jctiv and Lightering Co., New Orleans, La.....</p>	<p>\$1.75</p> <p>1.62½</p> <p>1.55</p>
<p>Bruah Mattress in place, per cubic yard.</p>	<p>\$1.00</p>
<p>Sandstone rock in place, per ton 2,240 pounds.</p>	<p>4.00</p> <p>3.90</p>
<p>For granite rock in place, per ton 2,240 pounds.</p>	<p>\$4.80</p> <p>4.80</p> <p>4.75</p>
<p>For oyster shell in place, per ton 2,240 pounds.</p>	<p>\$1.04</p> <p>1.75</p> <p>.50</p>

Extending Dike in New Haven Harbor,
Conn.:

BUILDERS.	Log foundation, rate per lineal ft. (200 lineal ft.)	Stone, rate per ton, (7,500 tons.)	Total.
James Roddin, Branford, Conn.	\$6.10	\$7.11	\$9,54
Francis H. Smith, New York....	5.50	2.79	19,02
John Beattie.....	6.13	1.12	9,62
Thomas J. Allen, New York.....	8.00	1.12	10,00
John A. Bouker, New York....	6.00	1.23	10,42

Repairing dikes in Connecticut River above Hartford, Conn.—400 cubic yards stone: C. C. Goodrich, Hartford, Conn., \$1.50 per cubic yard, total \$600; Charles H. Edwards, Quincy, Mass., \$1.61, \$644.

ABSTRACT of bids for removing 75,000 tons of broken rock from Middle Reef, or Flood Rock, Hell Gate, N. Y., opened by Lieut.-Col. Walter McFarland, October 15:

Atlantic Dredging Company..... William E. Chapman..... Morris & Cummings Dredging Company.. P. Sanford Ross..... American Dredging Company.....																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																					
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ABSTRACT of bids for extending pile dike at the mouth of the Passaic River, N. J., opened by Lieut.-Col. Walter McFarland, October 13: John A. Kelly, \$14.50 per lineal foot;

Samuel R. Cumming, \$13.23; P. Sanford Ross, \$11.50; Frank Pidgeon Dredging Co., \$12.97; Richard Parrott, \$13; Henry DuBois' Sons, \$12.38. P. Sanford Ross the lowest bidder.

Building Intelligence.

We solicit from each and every one of our readers information relating to projected buildings in their locality, and should be glad to receive newspaper clippings and other items of interest.

ABBREVIATIONS.—*b s*, brown stone; *br*, brick; *br st*, brick store; *bs dwell*, brown-stone dwelling; *apart house*, apartment-house; *ten*, tenement; *e*, each; *s*, owner; *a*, architect; *b*, builder; *fr*, frame.

NEW YORK CITY.

1396-1398 Av A, s s, br flat and store; cost, \$40,000; o, Louis Reiss; a, J. Brandt.

585 10th av, br flat and store; cost, \$18,000;
o. Julius Froehlich; a. Thomas Wilson.

BROOKLYN.

W. A. Wattber; a, M. Thomas.

BUILDING INTELLIGENCE.

ALTERATIONS, NEW YORK.

41 6th av, n w cor 4th st, 4-story br exten; cost, \$9,500; o, John Cavanah, on premises; a, J. T. Franklin; b, N. Conner.

198-202 Forsyth st, part of pork packing establishment raised to 4 stories; cost, \$10,000; lessees, Halstead & Co., 962 Lexington av; a, J. E. Ware.

MISCELLANEOUS.

BOSTON, MASS.—31 Melrose st, br dwell and store; cost, \$12,000; o, Wm. Neilson; b, A. R. Nasau.

73-75 Warwick st, br apart house; cost, \$35,000; o and b, Samuel Stubbs.

Dalton, cor Falmouth, iron storage; cost, \$72,000; o and b, B. & Albany R. R.

Westland av, br apart house; cost, \$45,000; o, Thompson, Allen & Gibson; b, T. R. White.

262-64 Shawmut av, br dwell and store; cost, \$15,000; o, G. W. Nasau; b, T. R. White.

211-13 W. Chester Park, br apart. house; cost, \$45,000; o and b, Albion Knowlton.

Essex st, cor Harrison av, br mer. store; cost, \$48,000; o, L. C. Shaw; b, Webster, Dixon & Co.

Derby and Clifton place, br dwell; cost, \$12,000; o, Trustees Hawes Fund; b, W. Eaton.

48 Troy st, br stable; cost, \$10,000; o, Margaret Arnheim; b, F. Bartell.

BALTIMORE, MD.—Calvert and Townsend, 12 3-story br dwells; a and b, Wm. T. King.

Arlington av, 3-story br dwell; o, Boston Fear.

Calvert, nr Preston, 6 marble front dwells; o, Wm. T. Phillips.

Wilson and D. H. av, 2 3-story br dwells; o, John Flannery.

CHICAGO, ILL.—Dearborn and 33d, br flats; cost, \$75,000; o, P. D. Armour; b, Patton & Fisher.

2321-23 Michigan av, br dwells; cost, \$22,000; o, Watson Hill; a, W. W. Clay; b, J. Beydell.

438-40 38th st, br flats; cost, \$12,000; o, Dr. C. E. Cadwell; a, D. S. Pentecost; b, B. G. Robinson.

1369-71 W. Madison, br st and hall; cost, \$16,000; o, Occidental Hall.

1015 N. Clark, br flats; cost, \$10,000; o, Mrs. E. Prouty; a, C. H. Gottig; b, M. J. Benson.

25-29 Campbell, br dwells; cost, \$12,000; o, W. H. Maple; a, H. R. Wilson.

189-95 Ogden av, br st and flats; cost, \$15,000; o, Alex. Bell; a, Geo. Beaumont; b, T. Keating.

450-52 N. Wells, br st and flats; cost, \$10,000; o, T. O. Brown; a, H. M. Hansen; b, Ed. Numson.

Milwaukee av and Bloomingdale Road, br dwells and sts; cost, \$29,000; o, C. O'Callaghan.

1859-63 Lake, br st and flats; cost, \$10,000; o, T. J. Diven; a, H. C. Zarbell; b, M. Conley.

586 Congress, br dwell; cost, \$10,000; o, N. B. Holden; a, L. B. Dixon; b, C. W. Damierr.

108-12 Vedder, br dwell and st; cost, \$12,000; o, Jul. Frank.

240-54 Jackson, 5-story br warehouse; cost, \$65,000; o, McNeill Bros.

407-25 Dearborn, 6-story br factory; cost, \$125,000; o, Donohue & Henneberry.

342 Ashland av, br dwell; cost, \$16,000; o, Mrs. E. Fulton; a, Treat & Foltz; b, Jos. Downey.

Bridewell Lots, br "house of correction," an addition; cost, \$150,000; o, The City; a, Jul. de Horvath.

DETROIT, MICH.—400 Gratiot av, br store; cost, \$10,000; o, E. Aertz & Co.; a, Donaldson & Meier; b, M. Blay & Son.

McKinstry av, br rolling mill; cost, \$50,000; o, Detroit Brass and Copper R. M. Co.; a, W. Scott & Co.; b, C. Moross.

Fort St, br store; cost, \$24,000; o, Daniel Scotten; a, W. Scott & Co.; b, A. F. Holmes.

ERIE, PA.—Chestnut st and L. S. & M. S. R. R., 1-story br 50x300 molding rooms; cost, \$10,000; o, Jarecki Manfg. Co.; b, H. Shank.

BUILDING INTELLIGENCE.

EVANSTON, ILL.—Stone church; cost, \$25,000; o, St. Mark's Episcopal Church; a, not fixed.

KANSAS CITY, MO.—N e cor 17th and Main st, 4-story br business house; cost, \$18,000; a, Van Brunt & Howe; b, F. M. Sharp.

N w cor 17th and Main sts, 4-story br business house; cost, \$72,000; a, Van Brunt & Howe; b, F. M. Sharp.

N w cor Brooklyn and Ind. av, 2½-story br res; cost, \$27,000; o, W. W. Arnold.

KANSAS CITY. — 1408-1410 Walnut st, lively stable; cost, \$10,000; o, G. W. Fitzpatrick; a, S. E. Chamberlain; b, George Youngclaus.

Gillis, near 5th, double flats; cost, \$10,000; o, W. J. Looney; a, S. E. Chamberlain.

LAKE VILLA, LAKE CO., ILL.—Br and fr hotel for summer resort; cost, \$22,000; o, E. J. Lehmann, Chicago; a, Treat & Foltz; b, not let.

LANCASTER, PA.—A \$300,000 jail will be built here. Judge Patterson, of the Common Pleas Court, can give information.

MILWAUKEE, WIS.—Anson Eldred has purchased sixty feet on Jefferson st for \$16,000. It is near Wisconsin st, and a bus-block will be erected thereon.

New buildings are to be erected in the town of Milwaukee by the Miller Brewing Company at an estimated cost of \$130,000.

Detroit, near Broadway, br bldg; cost, \$8,000; o, J. Meinecke.

30 Erie st, br bldg for lye-works; o, L. Meyers; a, C. A. Gombert; c, C. Duchow.

NORFOLK, VA.—The Y.M.C.A. will erect a bldg here. Address J. H. Calrow.

MINNEAPOLIS, MINN.—430 4th st, S E, dwell; cost, \$5,500; o, G. H. Andrews.

2120 4th av, S, br stores and flats; cost, \$25,000; o, Taylor & Clark.

1021 Lyndale av, N, br ven church; cost, \$10,000; o, St. Clotilde Church Society.

2510-12 4th av, S, 2 fr dwells; cost, \$12,000; o, D. T. Thompson.

115 15th st, S, br ten; cost, \$35,000; o, Jones & Brown.

701 Oliver av, fr dwell; cost, \$5,000; o, U. F. Griswold.

PROVIDENCE, R. I.—No large contracts since last report, small ones to amount of \$30,000.

PHILADELPHIA, PA.—Wynkoop, bet 13th and Juniper, 2-story br stable; b, Thomas Little & Son.

Allegheny av, bet Chatham & Gaul, 2-story church; b, George J. Wolf.

Elmwood, bet 63d and 64th, 2 dwells; o, George Laycock.

Bodine, n of Dauphin, 6 2-story dwells; b, Robert McClellan.

America, n of Dauphin, 2-story factory; b, Robert McClellan.

Front, bet Somerset and Cambria, 5 2-story dwells; b, William Steele & Son.

Emerald, bet Venango and Erie, 2 dwells; b, William Steele and Son.

Ontario, bet 21st and 22d, 2 dwells; o, Thomas A. Kershaw.

Sepviva, bet Huntingdon and Lehigh, 7 2-story dwells; b, Flood & Burton.

6th, bet Catharine, store; b, Charles McCaul.

6th, bet Tioga and Venango, 15 dwells; George F. Gibson.

Wistar, bet Mercer and R.R.R., 2 dwells; Charles W. Rufe.

Bacher, n of McFarren, 5 2-story dwells; o, J. R. Pyle.

St. Bernard Place, bet Chester av and Springfield, 4 dwells; b, James D. Arthur.

Fairhill, ab Lehigh av, factory bldg; o, P. H. Somerset.

Winton, bet 6th and 7th, 2 dwells; o, James Herser.

Hemberger, n of Berks, 2 3-story dwells; Dorothy Wagner.

James, bet Ridge and Railroad, 2-story school-house; b, Edward Delaney.

15th, bet Federal and Wharton, 5 dwells; b, Mowbray Bros.

BUILDING INTELLIGENCE.

Fremont, bet 12th and 13th, 11 2-story dwells; o, L. K. Slifer.

Cullen, bet 7th and 8th, 2 dwells; Edward Ward.

721 St. Mary's, dwell; b, Edward Ward.

757 Passayunk, store and factory; b, J. W. Kuhn.

Huntingdon, bet Cedar and Gaul, 6 2-story dwells; o, John H. Lock.

Ontario and 18th, 15 dwells; Charles L. Loney.

Springfield av, bet 54th and 55th, 2 dwells; b, William H. Free.

Willowgrove av, e of 25th, 3-story dwell and 2-story stable; b, John Hattenstein.

38th, n of Aspen, 2 dwells; b, Lafayette Hortor.

Mantua av, bet 31st and 32d, 3 2-story dwells; b, Howard Watkins.

43d, bet Aspen and Oregon, 10 2-story dwells; o, Thomas C. Sloane.

Smick, ab Jefferson, 3 dwells; o, Oliver J. Lehigh.

Memphis, bet Huntingdon and Lehigh, 8 dwells; b, Thomas C. Cadwallader.

Memphis and Tulip, 4 dwells; b, Thomas C. Cadwallader.

PAULDING CO., O.—Court-house; cost, \$40,000; a, E. O. Fallis & Co.; con., Earhart, of Defiance.

READING, PA.—Penn, 3-story br bldg for bank purposes, with stone trimmings; cost, \$15,000; o, Title and Trust Co., of Reading; H. Kendal, manager.

Penn, 4-story br bldg; cost, \$12,000; o, J. Bechtel; a, W. Fink; b, Mr. Titlow.

2d and Penn, 2-story br, trimmed with stone, for engine fire company; cost, \$12,000; o, City of Reading.

SHADY SIDE, PA.—The Baptist congregation of this place have decided to build a church next spring. Plans have not yet been made.

SARATOGA SPA.—Nothing new this week.

STRYKER, O.—Schoolhouse to cost \$6,000; a, E. O. Fallis & Co.; con., Schafer & Van Bern.

ST. LOUIS, MO.—Collins and Wash. sts, 2 adj. br warehouses; cost, \$10,000, o, H. Overstolz; a, I. Taylor; b, Goesse & Remmers.

22d and Pine sts, 2-story br carriage factory; cost, \$6,000; o, J. Rapp; b, F. F. Marley.

Mullamphy and Exchange sts, 2 br dwells; cost, \$5,500; o and b, M. B. Scanlon.

Delmar av and Sarah st, 3 adj br dwells; cost, \$10,000; o, H. Burnett; b, J. B. Lindsley.

Kusuko and Barton sts, br warehouse; cost, \$8,000; o, J. Boepple; b, Henninghouse.

10th and Morrison avs, 2 br stores; cost, \$9,000; o, F. Wilhelm; a, B. J. Goesse; b, X. Doerer.

Vandeventer and Washington avs, br warehouse; cost, \$12,000, o, F. R. Peters; a, A. Mouxheim; b, sub-let.

8th and Chestnut sts, 5 adj. br offices; cost, \$10,000; o, T. S. Noonan; a, Captain & Steinmann; b, sub-let.

9th and La Salle sts, 2 double br dwells; cost, \$12,000; o and b, T. Gugerty; a, L. Cass. Miller.

Easton and Francis avs, 2 adj. br dwells; cost, \$7,900; o, G. Kaufhohl; b, Bothe & Kattermann.

ST. PAUL, MINN.—Minnesota, bet Summit and Central avs, 3-story br dwell; cost, \$25,000, o, G. F. Schurmeier.

Exchange, addn to hospital; cost, \$10,000; o, Mother Bernardine.

Cleveland, e s, addn to college; cost, \$15,000; o, Rev. J. Ireland.

TROY, N. Y.—118 4th st, 3-story pressed br and stone front flat; cost, \$11,000; o, J. R. Hawley; a, C. E. Loth; m'n, J. Magill; carp., J. R. Hawley.

492 River st, 3-story pressed br front store and flats; cost, \$8,000; o, Wolf Gross; a, M. F. Cummings; b, Bulmer & Haines.

Vail av, 2-story fr cottage res; cost, \$4,225; o, August Loebel a, M. F. Cummings; b, Witze Bros.

BUILDING INTELLIGENCE.

TOLEDO, O.—Messrs. E. O. Fallis & Co., architects, report the following contracts recently let:

Frie, 5-story br bldg; cost, \$25,000; o, Odd Fellows Association; a, E. O. Fallis & Co.; b, Carl Schmull.

Warren, 12-room br bldg; cost, \$30,000; o, Board of Education; a, E. O. Fallis & Co.; b, A. Bentley.

Br business block; cost, \$12,000; o, P. Curtis; a, E. O. Fallis & Co.; b, J. V. Sanfleat.

Br business block; cost, \$8,000; o, Charles Isherwood; a, E. O. Fallis & Co.; b, John Stone.

Fr dwell; cost, \$12,000; o, John Kinnan; a, E. O. Fallis & Co.; b, Ernest Freund.

Br residence; cost, \$7,000; o, Calvin Barker; a, E. O. Fallis & Co.; b, Atwell & Sheets.

Br residence; cost, \$9,000; o, Harry Baker; a, E. O. Fallis & Co.; b, John Lee.

Also the following new buildings not let: Court-house at Independence, Kansas, to cost \$40,000; convent at Tiffin, O., to cost \$35,000; res. for N. H. Swayne, to cost \$20,000; res. for H. Clark, to cost \$7,000; res. for H. Suydam, to cost \$6,000.

WARWICK, MASS.—A steam saw-mill is to be erected here; George W. Smith is the sawyer; James White the engineer.

WORCESTER, MASS.—Main, br block; cost, \$35,000; o, Burnside Estate; a, Bradley, Winslow & Wetherill, of Boston; b, Norcross Bros.

Main, br ten house; cost, \$12,000; o, Rev. Mr. Abbott; a, J. B. Woodworth; b, J. C. French.

WASHINGTON, D. C.—Wallach Place, 18 2-story br bldgs; cost, \$65,000; o and a, T. F. Schneider.

1708 R st, 3-story br bldg; cost, \$12,000 o, J. M. Johnston; a, Hornblomer & Marshall.

19th and T st, 3-story br bldg; cost, \$15,000; o, R. Y. Sorrow; a, Durham & Co.

B and N Cap, 3 3-story br bldgs; cost, \$25,000; o, S. Shalabarger; a, H. L. Page.

19th, bet R and S, 3-story br bldg; cost, \$12,000; o, J. F. Dart; a, R. Stead.

Penn av, bet 4½ and 6th, 4-story br bldg; cost, \$29,000; o, Dr. C. Christian; a, T. F. Schneider.

Fifty permits less than \$5,000.

[TOO LATE FOR CLASSIFICATION.]

GOVERNMENT WORK.

THE following is a list of bids received October 20, 1886, by the Supervising Engineer and Architect, fire-proof building for Pension Office, for furnishing materials and labor for heating fourth floor of Pension Office Building:

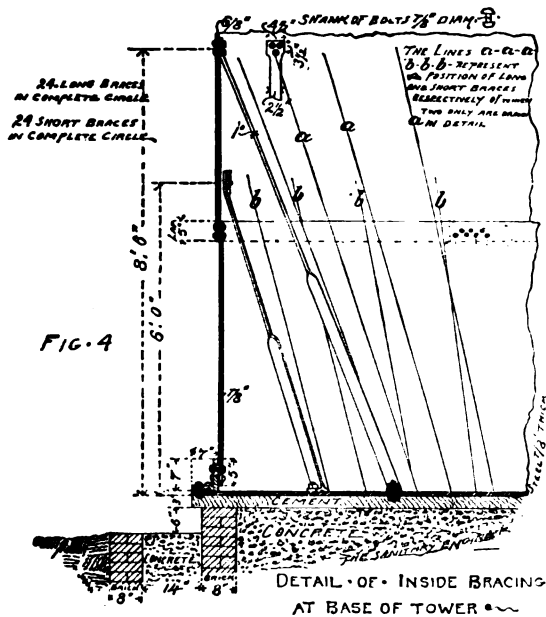
Bids for thirty-eight radiators with and without valves.—Nason Manufacturing Co., New York, \$846.72 Nason's radiators, \$38 for valves; Ezra T. Landis, Lancaster Pa., \$1,200 Landis radiators and Jenkins valves; Bartlett, Hayward & Co., Baltimore Md., \$848 Bartlett & Hayward radiators; John Lyon, Washington, D. C., \$888.16 Bartlett & Hayward radiators; Walworth Manufacturing Co., Boston, Mass., \$793 Walworth radiators, and with air-valves; William Rothwell, Washington, D. C., \$911.08 Nason, \$1,144 Bundy; A. M. Coyle, Washington, D. C., \$1,056, Detroit, with Marsh air-valves.

Bids for radiators, valves, and all materials in place.—Pierce, Butler & Pierce, Syracuse, N. Y., \$1,466 Bundy radiators, Jenkins valves; Thomas A. Gibson, Washington, D. C., \$1,525 Joy direct radiators, Jenkins valves; John Lyon, Washington, D. C., \$1,494.16 Bartlett & Hayward radiators; E. H. Cook & Co., Rochester, \$1,756 Reed, Bundy or Harris radiators, Jenkins valves; Walworth M'fg Co., Boston, \$1,490 Walworth radiators, valves not stated; Bates & Johnson, Washington, D. C., \$1,995 Bundy radiators, Jenkins valves; N. L. Chapelle & Co., Washington, D. C., \$2,338 Nason or Reed radiators, Jenkins valves, \$3,000 Gold radiators; A. M. Coyle, Washington, D. C., \$1,550 Detroit radiators, Marsh valves; William Rothwell, Washington, D. C., \$1,446.08 Nason, \$1,679 Bundy radiators; Edward L. Dent & Co., Washington, D. C., \$2,074.50 Bundy radiators, Breckenridge valves.

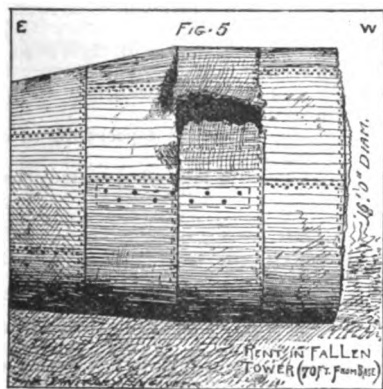
Bids for materials other than radiators, and doing all work—John Lyon, Washington, D. C., \$606; Walworth Manufacturing Co., Boston, Mass., \$697; William Rothwell, Washington, D. C., \$535.

16 feet in diameter to a height of 70 feet, contracted at that point by a conical frustum 25 feet high to a diameter of 8 feet, which it held the remaining 155 feet to the top.

It rested on a bed-plate, 17 feet 2 inches in diameter, of $\frac{3}{8}$ -inch steel plates cut in quadrants and united with 5-inch lap-joints by rows of 1-inch rivets, staggered.



This plate rested on three inches of cement, covering a foundation, the core of which, 15 feet 5 inches in diameter, was concrete surrounded by two concentric rings of $7\frac{1}{2}$ -inch brick masonry, with a 14-inch annular interval between the brick circles, also filled with concrete, making the total diameter of the foundation 20 feet.



The plates of the tower were of uniform surface dimensions from bottom to top, the frustum plates excepted. The vertical intervals between girth-joints from centre to centre of lap were 5 feet throughout. There were six plates in the circle where the tower was 16 feet in diameter, and three where it was 8 feet in diameter, each plate being 8 feet 4 inches from centre to centre of vertical

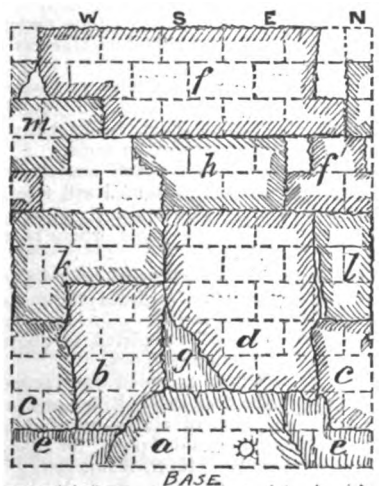


FIG. 6

seams. The thickness of the bottom circle of plates was seven-eighths of an inch in diameter. The thickness of plates above this diminished from below upward in the following proportions: Six circles of $\frac{3}{8}$ -inch, 13 circles of

$\frac{3}{8}$ -inch, 6 circles of $\frac{1}{2}$ -inch, 12 circles of $\frac{3}{8}$ -inch, the remaining 12 circles of $\frac{3}{8}$ -inch.

The tower was attached to the bed-plate, as shown in Fig. 4, by an outside, equal-legged, $7 \times 7 \times \frac{7}{8}$ -inch steel angle. The riveting of the angle to the girth-plates and bed-plate was by two rows of 1-inch rivets, staggered, and with 2 inches between the rows and $2\frac{1}{2}$ inches pitch. The lap on the vertical of the angle was 5 inches, the interval between the lower edge of the plates and the bed-plates being 2 inches. The vertical seams to a height of 40 feet were held by a triple line of staggered rivets, the rivets in the outer rows, opposite each other, and $3\frac{1}{2}$ inches apart from

centre to centre, with a pitch in the rows of $3\frac{1}{4}$ inches. Above this there were but two rows of staggered rivets, and with an interval of 2 inches between them, and a pitch of $2\frac{1}{2}$ inches. The girth-seams were staggered with the same spacing, slightly varied toward the top. The lap in the vertical seams varied from $6\frac{1}{2}$ inches at the bottom to $4\frac{1}{2}$ inches at the top.

At the base of the tower within, a double circle of inclined braces, of $2\frac{1}{2} \times 1$ -inch iron, were triple-riveted to the second circle of plates and fastened by two $1\frac{1}{8}$ -inch bolts to the bed-plate. The tops of the longer braces were $8\frac{1}{2}$ feet from the base, and their lower ends 40 inches

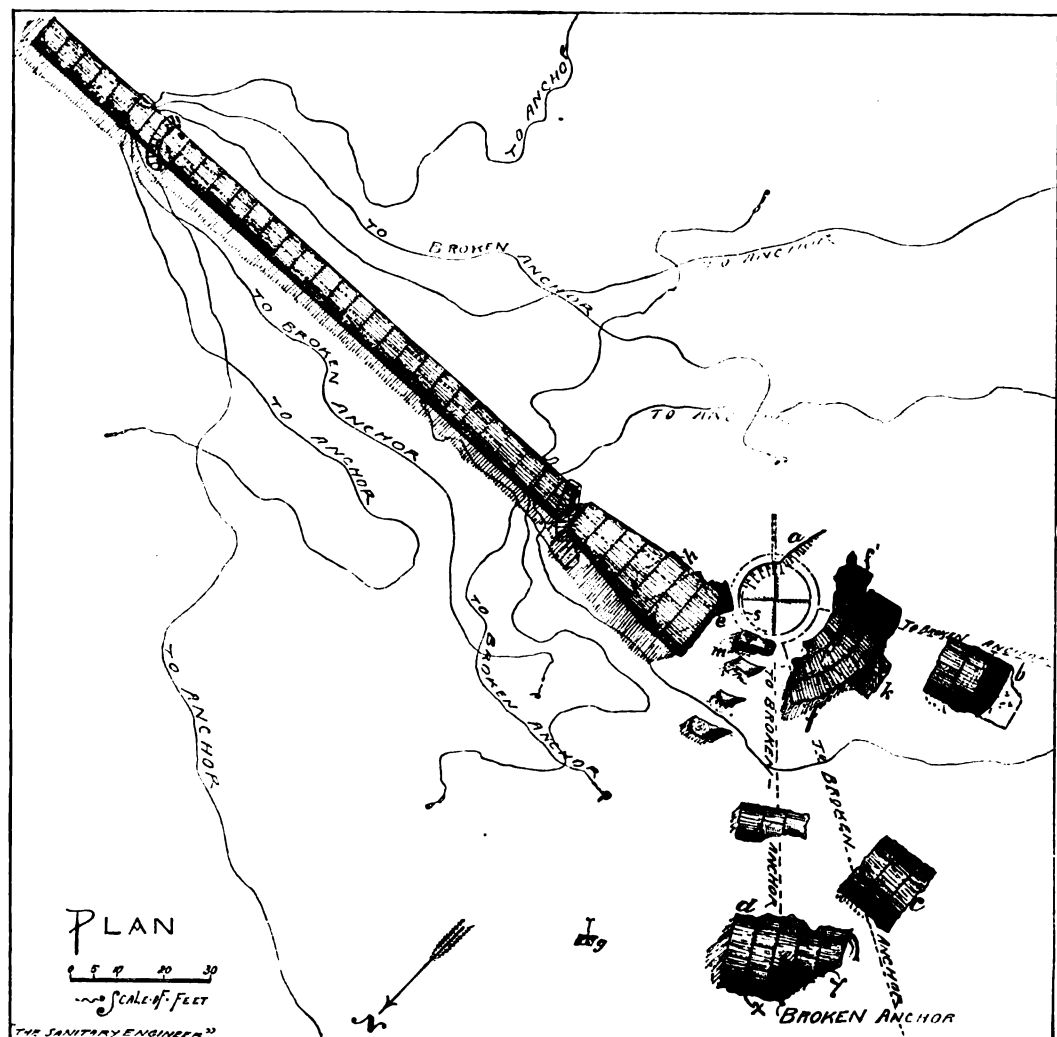
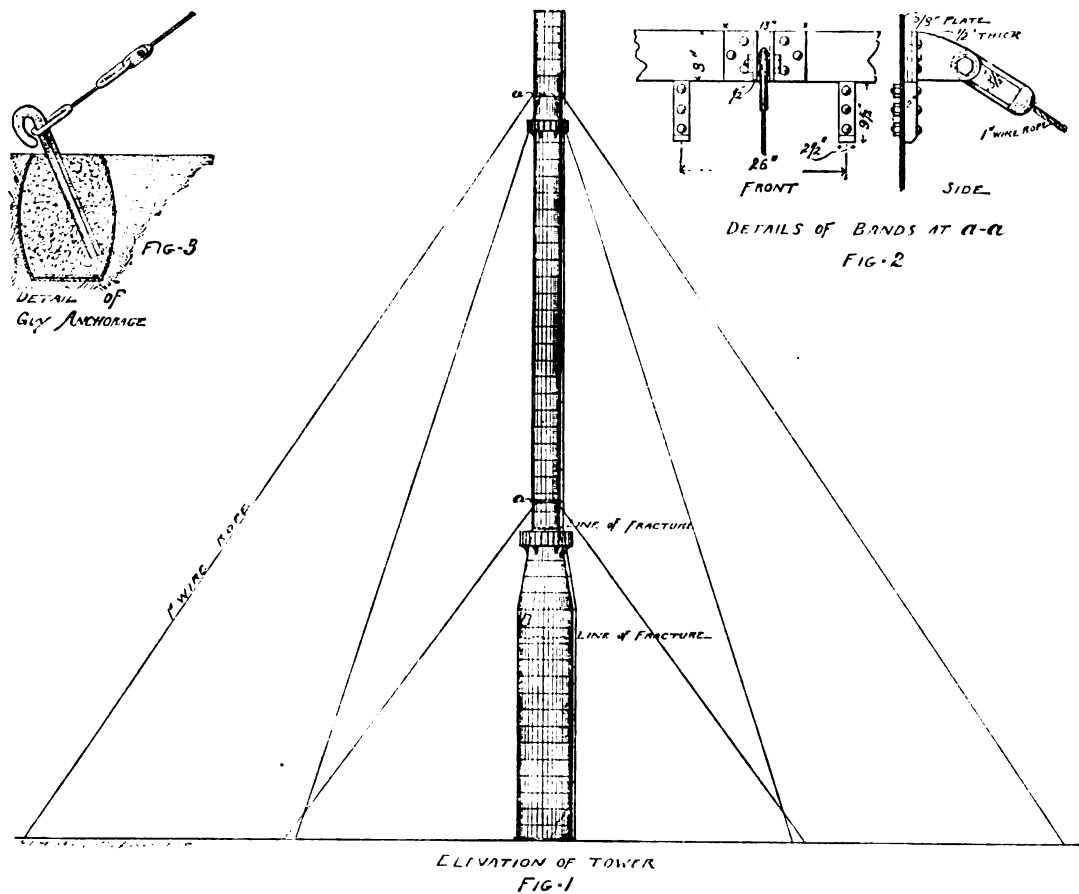


FIGURE 8.

inside the base circle; the tops of the shorter braces were 6 feet from the base, and 20 inches inside of the base circle. There were 24 braces in each circle.

At the base, and also at the top of the frustum, 6 vertical stiffening pieces of 4-inch T-iron, $\frac{1}{4}$ -inch web, 9 feet long, reaching $4\frac{1}{2}$ feet above and below the extremities of the frustum, were bolted to the plates within by $\frac{3}{8}$ -inch bolts, placed 11 inches apart and on alternate sides of the web.

The bolts had $\frac{1}{8}$ -inch washers, $2\frac{1}{2}$ inches in diameter, the nuts being outside and made tight with asbestos grummetts.

Five similar vertical stiffening T-irons, 25 feet long, were bolted to the topmost five circles of plates, with slightly modified detail of size and spacing of bolts. A $3\times 3\times \frac{1}{4}$ -inch angle-iron formed the ornamental finish of the tower without.

At a circle 224 feet vertically from the base an 8-inch welded collar of $\frac{3}{4}$ -inch iron rested on twelve lugs riveted to the tower. This collar carried the $3\frac{1}{2}$ -inch pulleys for six 1-inch wire-rope guys, details of which are shown in Fig. 2. This attachment was duplicated at a circle 104 feet from the base. The guy-anchors were $3\frac{1}{2}$ inch iron rails imbedded in barrels of concrete sunk in the ground, as shown in detail with the turnbuckle in Fig. 3. The outer circle of anchors was 150 feet from the base of the tower, the inner circle 80 feet, the points of anchorage in the two circles alternating.

A light wrought-iron ladder on the south side led to two balconies 10 feet below each of the guy-collars; at the level of each balcony as well as at the base were covered manholes 12 inches by 16 inches orifice.

The inlet-main, 14 inches diameter, entered horizontally by a $\frac{1}{4}$ -bend from the vertical in the bottom band of plates on the south-east side, the inlet being a branch from the service-main. There was no independent outlet. Near the inlet in the same circle of plates was a 4-inch tap, and in the centre of the bed-plate a 4-inch brass plug.

After the catastrophe the tower and fragments lay as shown in Fig. 7, the main column lying about north-east, the top crushed to an imperfect ellipse of 2 feet minor diameter. At the 95-foot level, the junction of the 8-foot cylinder and top of the frustum, the tower had parted by tearing along the inner or upper line of rivets completely around the circle, leaving an evenly scalloped fracture in the $\frac{3}{8}$ -inch plates. The parts had separated about 3 feet. At this line of fracture the cylinder was compressed to an ellipse 7.67 feet vertical and 8.15 feet horizontal diameter. The fractured surfaces of the steel showed distinct striation parallel to the surfaces of the plate. This was true of almost all the fractured edges of the wreck, which in general followed the lines of riveting farthest from the edges of the outside sheets. In very few instances were the rivets torn or sheared.

The longitudinal stiffening T-irons remained unbroken, having sheared the bolts, and were all attached to one or the other of the separated parts.

At the 60-foot circle, which was 2 plates below the base of the frustum, the tower was fractured along the inner line of rivets of an outside sheet completely around the circle. The frustum remained complete, with 2 circles of plates of the 16-foot cylinder attached to it, as shown in Fig. 5, with its axis still continuous with that of the 8-foot cylinder. The lower edge of this portion showed complete fracture along the upper line of girth-rivets. For about one-third of the circumference, representing in the original position of the tower the angle south-south-west to east-north-east, the plates were battered and curved inward on themselves. This edge of the fallen tower lay within a foot of the foundation at its nearest point. In the circle of plates below the base of the frustum on the original north side a burst occurred, following the seams as shown in Fig. 5.

The tower below this level, representing 72 plates, was fractured and scattered into more than a dozen pieces, the largest containing but 15 plates. Figure 6 represents the largest pieces relocated on the developed cylinder, with reference to their original compass positions as shown at the top. The letters on the plan Fig. 8 show the corresponding fragments as they lay after the tower fell, and suggest the courses they took.

Fragment *a*, two circles of plates in height, and 25 feet of arc, remains attached to the bed-plate for 12 feet, with five long and five short braces in place. Half of this piece was much flattened and swung out to the south-east as on a hinge; with the exception of the attached fragment the steel angle on the base plate was torn completely around the circle in the angle.

Fragments *b*, *c*, *d*, *g*, each carrying one or more interior base-braces, lie with the convex or outside up. The dotted portion of *b* is bent under it as it lies. The braces of fragment *c* are all bent sharply under it. Fragment *d*, weighing about 7 tons, lies 61 feet from the base of the tower; it is flattened at its broader end to an arc of 19 feet 6 inches, having a chord of 16 feet 8 inches. A single base-brace is attached to its point. There are two flaws to be seen in the plates of this piece, one at *x*, on the inside, the other at *y*, on the outside. At *x* an incipient line of fracture shows which has been checked from spreading by rivets driven in the plates at each end of the scar; these rivets are 3 inches apart from centre to centre, and lie 16 inches from the seam. The inside tar-coating shows no fracture here as it does at rents occasioned by the fall. The scar at *y* is 5 inches long, extending from the edge of the plate by a zig zag line, passing under four of the girth-rivets, and extending $2\frac{1}{2}$ inches up the plate. Marks of a calking-tool show on each side of it.

Fragments *e*, *f*, *h*, *k* lie with the inner or concave sides up. The edge of *f* near the foundation is curved sharply inward on itself, and shows brick and cement adhering to its fractured edge.

Fragment *e* carries the torn angle on its lower edge.

On the bed-plate, which remains nearly horizontal, is a deep scar, shown by the dotted line *s*, Fig. 8. This scar is about 6 inches inside of the base circle of the tower and covers the quadrant from north-east to north-west. The foundation of the tower to the westward outside of the bed-plate has been torn away in parts and the earth beyond it thrown out to a depth of 5 feet; none of the guy-ropes or guy-connections at the tower end were severed. The two anchors in the larger circle to the west-south-west and south-south-west were ruptured, as also one in the smaller circle to the westward. The fractures occurred in the iron rail imbedded in the cement.

The field was flooded to a distance of 250 feet in each direction, covering an area of about six acres.

The sequence of events in the disaster appear to have been, first, a seam-rip through a line of rivets near the south-west side, at or near the base, extending upward through ten plates to a height of 50 feet on the south side and 60 feet on the north; in connection with it a centrifugal flinging of the fragments of the cylinder on a vertical axis to the positions which they now occupy. The piece *b* would seem to have been the first one detached. Following this the large piece *d* was flung violently around, and the structure then seems to have fallen vertically, striking the foundation on the west side close to the base and careening the tower to the eastward, with an accompanying axial twist in the same direction (caused by the pressure on *d*) of nearly ninety degrees, severing at the same time the girth-seam at the 60-foot level. The tower then fell vertically, striking the bed-plate on the north-east side, and was overthrown to the eastward and was ruptured at the 95-foot level by the blow on the ground.

[Assuming that rupture first occurred in the lower ring of plates, and that the pressure was 100 pounds per square inch, the strain on each inch of height of the plate would be

$$\frac{16' \times 12' \times 100 \text{ pounds}}{2} = 9,600 \text{ pounds.}$$

As this plate was seven-eighths of an inch thick, the strain per square inch

$$= 9,600 \times \frac{8}{7} = 10,970 \text{ pounds.}$$

But the rivet pitch being $3\frac{1}{4}$ inches and the rivets 1 inch makes the actual strain

$$10,970 \times \frac{3\frac{1}{4}}{2\frac{1}{4}} = 15,850 \text{ pounds.}$$

As the rivet-holes were probably larger than this the static bursting strain would be somewhat larger.

Similarly at the bottom of the lowest ring of $\frac{3}{4}$ -inch plates we would find a static strain of about 18,000 pounds.

Though the rupture occurred while the pumping was progressing, and at a point nearly opposite the inlet, we are unable to estimate what, if any, effect this intermittent pulsation produced, nor have we any evidence that the foundation was insecure or inadequate; neither, according to the figures here given, would the elastic limits of the steel seem to have been passed.

We are led, therefore, to conclude that the immediate trouble was either in the steel or the method of working it, and probably in both. The occurrence of the

calked crack and the crack with rivets at the ends certainly indicates the former. As to the latter, a workman who would do either of the things last mentioned would not hesitate to use a drifting-pin. It seems also to be fully demonstrated that while with punch and bolster properly adjusted as to clearance, holes can be punched in *thin* steel plates without seriously weakening the steel, the same is *not* true of thick plates, and that the only safe rule is to drill them, or to punch them and then ream out about $\frac{1}{8}$ -inch all around the hole. When punched, the metal around the hole is left in a state of strain, and tearing between rivets ensues at much below the full strength of the metal.

That the failure was progressive is most clearly evidenced to any person who will study carefully the present position of the fragments and tower and the position they occupied before the accident.

We do not think the failure should deter any person from the use of steel. It rather shows that the engineer who uses it must use it understandingly, and that close inspection is necessary to see first that the steel is of a proper character; and second, that it is honestly and properly manipulated. When *this* is done we should have no hesitancy in availing ourselves of its superior qualities as a structural material.—ED. SAN. ENG.]

The following, we are informed, is a copy of the specification under which the work was done:

I will make and erect on a foundation prepared by you, near Coney Island, New York, a stand-pipe, 250 feet high, as described below:

Pipe will be 16 feet diameter up 70 feet, then in the next 25 feet taper in to 8 feet diameter.

Bottom of $\frac{3}{8}$ -inch steel, 17 feet diameter.

Bottom course connected to bottom by $6\times 6\times \frac{3}{8}$ -inch angle-iron, flanged turned out.

First 5 feet of pipe of $\frac{7}{8}$ steel, with three rows of rivets in vertical seam.

30 feet of pipe of $\frac{3}{4}$ steel, with three rows of rivets in vertical seam.

15 feet of pipe of $\frac{3}{8}$ steel, with three rows of rivets in vertical seam.

20 feet of pipe of $\frac{3}{8}$ steel, with two rows of rivets in vertical seam.

25 feet of pipe of $\frac{3}{8}$ steel (taper) with two rows of rivets in vertical.

5 feet of pipe of $\frac{3}{8}$ steel (first course above taper.)

30 " " " $\frac{1}{2}$ "

35 " " " $\frac{3}{8}$ "

30 " " " $\frac{1}{2}$ "

30 " " " $\frac{1}{2}$ "

25 " " " $\frac{1}{2}$ "

For the first 75 feet the courses will be all inside, so that height the diameter will be lessened by the thickness of the plates.

In the taper the courses will be all inside, and above that they will be large and small.

All the plates will be steel stamped 60,000 pounds tensile strength.

All of the vertical seams above the first 50 feet, and all of the horizontal seams, will be double riveted, with sufficient lap to make a good job.

I will rivet on to the outside of pipe a ladder, running from top to bottom, lower half of sides of $2\times \frac{1}{2}$ -inch iron, upper half of $2\times \frac{3}{8}$ -inch bar-iron, and rounds of $\frac{3}{4}$ -inch round iron 16 inches long and 12 inches apart.

I will rivet to pipe three manhole frames, position as shown on tracing; also two nozzles on bottom course.

I will rivet on to pipe two balconies (one under each of the upper manholes) with wrought-iron brackets and floor as shown on tracing.

I will furnish and attach to the pipe 12 guys of 1-inch wire-rope, six of them 100 feet from the ground, and six 25 feet from top, the understanding being that you are to furnish and put down the anchors for same.

I will put around the top a 3×3 -inch angle-iron, and on the inside of the 25 feet of $\frac{3}{8}$ iron, I will rivet 4×4 -inch T-irons to stiffen the same. I will also rivet on twelve 4×4 -inch T-irons to strengthen the joints where taper section of pipe joins the straight.

Each piece to be 10 feet long and extend 5 feet above each joint and 5 feet below. (Eight of these T-irons on lower joint and four on upper.)

Price for the "stand-pipe" completed as above, water-tight, and to your satisfaction, \$16,625.

In the above price I have accepted your proposition to do the teaming from the dock at Bay Ridge or Long Island City to "stand-pipe" site, of all the material and tools used in the construction of said "pipe" for \$350.

Yours, (Signed) H. S. ROBINSON.

By J. M. Robinson.

THE *American Machinist* announces that Mr. J. G. A. Meyer, author of "Modern Locomotive Construction," has entered the editorial staff of that journal.

THE contractors and builders of Allegheny County, Pa., have formed a builders' exchange, with headquarters in Pittsburgh. The President is George A. Cochran, the Secretary E. A. Knox.



ENGLISH PLUMBING PRACTICE.

BY A JOURNEYMAN PLUMBER.

No. LXIII.

(Continued from page 470.)

SOIL-PIPES (CONTINUED).

In my later papers I gave some illustrations of plumbing-work badly designed. I now propose to pass on to a better class of work done in this later and more enlightened age. But first of all we will look at water-closet traps. The commonest kind of trap used a few years ago, and which has been illustrated, written, and spoken about in such a way one would think that the last had gone into the melting-pot never to return, except in another form, is still very frequently used by a certain section of people. The D-trap, Fig. 1, is referred to, and it is to be hoped that our lately organized Plumbers' Registering Committee will keep their books clear of the names of those who advocate its use in preference to all others. Some fourteen or sixteen years ago a plumber, who was in advance of his time, saw some of the evils attached to the D, and designed a trap as illustrated in Fig. 2. This was a great improvement, as the scour through this trap kept it much cleaner than the old-fashioned one could be, and, in addition, if the gases emanating from sewage corroded the trap it could be discovered by water leaking out of the holes; whereas, in the

so strong as the wiped one described in Fig. 4 trap. Some years ago commenced a new era in trap-making, when they began to be cast, instead of being made by hand. The old patterns, with very little variations, of the D and round-pipe P traps were made, and then later on a patent was taken out for casting traps on the principle of that shown at Fig. 2. Figure 5 is an illustration of this trap, which is now being superseded by that shown at Fig. 6. In Fig. 5 the body of the trap is much larger than the inlet, but in Fig. 6 the sizes are in reversed order, the waist of the trap being much smaller than the inlet. The inlet is four inches, and the body of the trap three inches in diameter. Those the writer has fixed have been found to be quite free from fur after two years' usage, and he has seen one fixed nearly four years ago which had pieces of glass fitted to the sides. Although the water-closet over this trap is much used, the accumulation of fur is so very small that a person standing on one side of the trap can see the light of a candle held on the other side. The patentee claims that this trap is proof against momentum, or the water rushing through the trap, as described when alluding to Fig. 4, and certainly the trap fulfills the claim.

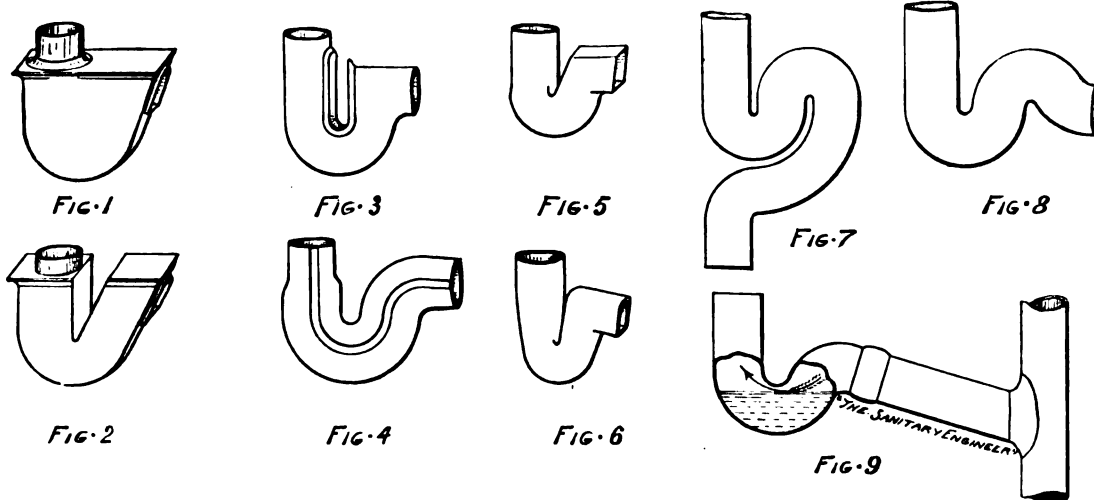
In addition to cast-lead traps, a great many are being used that are made in the same manner as drawn-lead pipe—that is, the lead is forced through dies which gives it a round section, but by manipulating the press the pipe as it issues from the dies is made to curve round in the desired shapes to form traps to use in various positions. To show how much under control is the press for making traps, one kind is shown at Fig. 7, which is of one piece, no solder or other means of joining lead together being used.

Figure 8 is a trap differently shaped, but made by the same means as the other one. Figure 8 is made especially to the order of a master plumber, who claims that it is proof against momentum. Reference was made (see papers 4 and

way. If the piece of pipe from the trap to the vertical soil-pipe has been cut too short, the P-trap has been strained open and so distorted in shape in the endeavor to make it longer, that the water-seal is broken as shown by Fig. 9. In other cases the vertical soil-pipe has been insufficiently supported, with the result that it has broken away from its fixings, and slid downward, causing the branch-pipe to drag down the outgo-end of the trap, thus breaking the water-seal. The straining and bending of traps in their position after fixing is a natural sequence with those men who work by rule of thumb. It will illustrate this: When a plumber is going to fix a trap and soil-pipe, he will often stand a length of soil-pipe in the position intended for fixing it. He will then place the trap in its position, and take a short piece of soil-pipe and cut and rasp the ends to fit between the trap and vertical pipe. The next operation is to remove the whole of the work to the bench in the workshop, when the hole is cut in the vertical pipe, and the necessary soiling and shaving done to the parts intended for soldering. The work is again placed in its position and the parts fitted together. After doing this the joints are "tacked,"—that is, some hot solder is splashed on the joints and left until it has set. The work is now again moved to the bench and the joints made. During the operation of making the joints it frequently happens that so soon as the tacking solder is melted, the work will shift and so get out of its proper position. On again moving the piece of work into its position it will be found not to fit; but lead being a very soft metal it is easy to "spring" it—that is, bend and pull it—until it suits position.

This rule-of-thumb business should be strongly condemned. In the first place, a great deal of time is wasted when moving the work up and down between the shop and the intended position. The shop is generally in the basement, and the work may perhaps be going to be fixed on the third, fourth, fifth, or sixth story of the building. In spite of all care taken when fitting the work it frequently happens that it does not "fit" when completed. The proper way of setting out this kind of work will be described in the next paper.

(TO BE CONTINUED.)



D-trap, the dip-pipe being exposed on both sides to the action of the gases was soon eaten through and this rendered the trap useless for keeping smells from escaping. Being out of sight, these holes very rarely can be discovered until the smells become so bad as to lead to the water-closet being taken up for the trap to be examined.

Figure 3 is an illustration of a good old trap. One is shown at the Parkes Museum of Hygiene. The writer has seen a few taken of a certain locality in London, and as they are not generally met with, it leads to the presumption that they are all the work of one man. From appearances one is led to the conclusion that the body of the trap was bossed up and then the throat-piece wiped in afterward. A friend of the writer's, and a man of great experience, used to make all traps for fixing beneath water-closets as Fig. 4. The traps were made in two halves, and I have assisted to make them, on iron molds, and then soldered together afterward by wiping a seam on each side.

The inlet and outlet ends were four inches, but the body of the trap was made five inches in diameter. They were made in this way with the object of reducing the syphonic action that takes place more or less with all unventilated traps when fixed under water-closets, and with a soil-pipe attached to the outgo. Another reason was to break the impetus of the water discharged from a water-closet. The impetus given to the water when falling into the trap often being sufficient to carry it right through an ordinary round-pipe trap, scarcely any water remaining behind to form the proper seal. In the north of England great numbers of traps are made as shown at Fig. 4, but of equal diameter throughout, the seams at the sides being made with fine solder and copper bit. This seam is not nearly

5, Vol. VIII. of THE SANITARY ENGINEER) to traps sometimes made by hand for fixing under water-closets. A great many other examples of traps could be given, but it is quite unnecessary, as they are mostly made on the lines of those that have been described. It may be added, however, that all traps for fixing under water-closets must have a clear waterway through them, and that mechanical traps such as those with hinged flaps or valves, or balls, either floating or heavy, so arranged as to form an effectual seal, cannot very well be used, as paper and other matters that pass through a water-closet would cling round the working parts and so render them useless. In some cases certain matters would accumulate round the valves, etc., and in time form a complete stoppage.

The subject of traps cannot be dismissed without a few remarks on trap-fixing. It is admitted by all advanced sanitary engineers that traps are necessary under water-closets and other fittings that require waste-pipes. There are some few people who think otherwise, but they are mostly amateurs, and those of limited experience. If we are to accept the dictum that traps are necessary, it follows that they should be fixed in such a way that they are not rendered useless by the way of fixing them. One of the first things to guard against is fixing the traps in such a way that the seal is broken. The writer has several times found traps fixed as shown in sketch section, Fig. 9. D-traps, and also the P-traps, have been found to have the seal broken by improper fixing. In some instances this appears to have arisen from branching the trap outgo too low down in the vertical soil-pipe when the trap has been pulled up after fixing so as to be in its proper position for the water-closet. It may also have occurred in another

PHILADELPHIA MASTER PLUMBERS' ASSOCIATION.

THE regular monthly meeting of the Master Plumbers' Association was held in the association rooms, 139 North Seventh Street, the President, William W. Mentzinger, in the chair, and Enoch Remick, Secretary.

A number of communications were read—one from Washington, D. C., asking information with reference to the organization of a master plumbers' association, another was a circular from the New York masters on the strike in the metropolis, and still another was a copy of laws of the Builders' Exchange projected for this city. These were all referred.

The Registration Committee reported having completed their labors of making a list of the regular master plumbers in the city and found the total aggregated 390. This number is considerably less than the number to whom the Board of Health have issued licenses, but it is supposed that a number who received the board's license are not in the business regularly, or else are foremen-mechanics for large corporations.

The Board of Directors followed with a report on the violations of regulations of the plumbing laws referred to them at the last meeting. The report set forth that in each case, with a single exception, the violations had been attended to by the health officers and the work done over properly. This single exception was in the case of a plumber named Henderson, who is now a member of City Councils, who some time since received special permission to violate a rule requiring a fresh-air inlet in connection with a drain inside the trap. The fact that this violation had been permitted by the Board of Health raised quite a breeze in the association, and several of the members wanted to follow up the case of Blabon, wherein a violation of the rules on permission of the board had been enjoined by the courts, with another like movement, but it was finally determined to postpone action until the next meeting and see what action the board would take in the meantime.

A committee on the formation of a Builders' Exchange in this city reported that they had attended a conference of representatives of different building trades to discuss the matter, and recommended that the association take part in such a federation. The object of the exchange will be for

mutual protection and benefit to all persons in the building business. The report was agreed to.

As the rooms of the association, lately used by it as a school-room and work-shop in the building, was in a very bad condition owing to contemplated improvements by the owner of it, and it is desirous to shortly commence the session of the Trade-School, the owner was notified to have them put in proper condition again.

The strike in New York was then discussed, and the masters' course approved, after which the association adjourned.

TORONTO MASTER PLUMBERS' ASSOCIATION. (From an Occasional Correspondent.)

TORONTO, October 8, 1886.

THE Master Plumbers' Association met in their rooms on the 7th instant, and after routine business elected officers for the ensuing year: A. Fiddes, President; W. J. Burroughes, Secretary; John Ritchie, Sr., Treasurer; John Wright, Vice-President; W. J. Gibson, Sergeant-at-Arms. All the above gentlemen were the officers for the past year. They were elected unanimously; some of them desired to retire and give over the honors to some other worthy member, but their protests would not be listened to. The Association has done good work during the first year of its existence, and promises to become strong in membership and influence. It is proposed to hold some entertaining meetings during the coming winter.

Correspondence.

EFFECT OF WIND-PRESSURE ON TRAPS AND ADVANTAGES OF FRESH-AIR INLET.

TORONTO, October 8, 1886.

SIR: I notice in THE SANITARY ENGINEER of September 30 a communication from Mr. Hoyt on the effect of wind on the seal of traps on plumbing fixtures, and having had some experience on this subject, am more than a little interested in it. My experience, however, differs somewhat from that of your correspondent. In the first part of his letter he says that trap-seals are destroyed by high winds when the soil-pipes are ventilated in the usual way, and that a fresh-air inlet-pipe does not lessen the difficulty. Two years ago I fitted up in my bath-room a new wash-out hopper-closet. The soil-pipe was connected to the main drain and extended above the roof in the usual way. During very windy weather I noticed the water in the trap was much disturbed, and at times the seal was completely destroyed. I attempted to cure this down-draft by placing what is called an exhaust ventilator on top of the soil-pipe, but none of them did any good. I then put in a fresh-air inlet at the foot of the soil-pipe, and took off the patent cowl on top, and have never seen the water disturbed since, and during high winds there is a strong current through the pipe.

I also know of a case where the traps on plumbing fixtures in a building were frequently forced by wind-pressure, but in this case the wind blew in at the outlet end of the drain. The building in question has two 6-inch drains discharging into the lake above high-water line, and at a distance of 400 feet from the building the drains were continued from their outlet to a point above the roof *without a trap*, and receive the waste-water from the plumbing fixtures only. During windy and stormy weather the whole of the traps on the fixtures would be more or less disturbed, those on the ground floor and basement the most. At times a tide wave would strike the mouth of the drain and the water in the sink-traps in the basement would be forced up through the gratings several feet. The drain was opened up at a point about forty feet from its outlet, and a valve-trap inserted, a fresh-air inlet put in on the house side, and no inconvenience has been felt since. In your comments on Mr. Hoyt's letter you say under the conditions above mentioned the traps could not be forced where the soil-pipes are properly ventilated. In this case every trap has a separate vent-pipe its full size, except the closets, which are hoppers and have 2-inch vents.

The theory propounded by Mr. Hoyt, that traps are unsealed by low temperature, and the changes in the density of the atmosphere, I think is absurd. The only times I find the cold to affect the seal of traps was when the end of soil-pipe above the roof has been hermetically sealed by hoar frost and ice (*which often occur in this climate*), and a large volume of water discharged into the soil-pipe will

create a vacuum that will syphon all the smaller traps connected with it.

Respectfully yours,

W. I. BURROUGHES.

[The proper ventilation of soil-pipes, as we used the phrase, contemplates the fresh-air inlet, which we regard as indispensable in any properly constructed drainage system. The location of fresh-air inlet, of course, must be governed by local circumstances.—ED. SAN. ENG.]

IRON FITTINGS FOR POLAND.

FABRYKA HYDRAULICZNA
M. TRECHCINSKIEGO
W WARSZAWIE,
ulica Krucza Nr. 1757c (nowy 7).

No. 421. WARSZAWA, d. 28 September, 1886.

SIR: I am interested in certain malleable cast-iron fittings for water, steam, and gas which are only turned out in the United States of North America, and which I receive through a German agency. I have noticed, however, the brands of the following two firms, "M. I. F. & Co." and "B. St. J." on the fittings, and as it would be a great advantage to me to receive them direct from the works, it occurred to me that perhaps you might be acquainted with the firms in question or others.

If you could kindly send me the addresses of these firms, I should feel greatly obliged. Thanking you in anticipation, I am, yours faithfully, M. TRECHCINSKI.

[The address of above is, "Marcelli Trechcinski, Kreuza No. 7, Warsaw, Poland.]

[Referred to our readers.]

THE VENTILATION OF SHOW-WINDOWS.

BOSTON, October 2, 1886.

SIR: I notice in this week's issue of your paper, page 422, a query about the accumulation of watery vapor on the inside of show-windows where gas is burned. It seems to me that in your reply you overlook the principal fact of the case—viz., that the combustion of street-gas produces water, so that if your correspondent were to follow your advice, and apply a "row of gas-jets" in the ordinary way, he might make the matter worse.

The facts are as follows, which can be verified by any book of chemists' or physicists' tables of reference:

Any nine pounds of water is composed of one pound of hydrogen and eight pounds of oxygen. If we burn a pound of hydrogen, therefore, we take eight pounds of oxygen from the surrounding air, and the inevitable result is nine pounds, or over a U. S. gallon, of water. A large gas-jet, such as is used in a show-window, consumes at least five cubic feet of street-gas per hour. The principal ingredient of this gas in bulk is hydrogen. Suppose a burner to consume five cubic feet of hydrogen per hour, regardless of the other ingredients, the rate would not be unusual. This five cubic feet weighs about $184\frac{1}{8}$ grains. The product would be nine times as many grains of water, or 1,660 grains. In other words, since a cubic inch of water weighs about 252 grains, this water would occupy a bulk of $\frac{1660}{252} = 6\frac{5}{9}$ cubic inches, which when spread over a window, would make quite a show. Of course, the more gas-jets we supply the more water we produce. It is true the water thus formed is at a temperature far above the boiling point, and is therefore in the form of vapor.

The air in the immediate neighborhood of the burners is warm enough to sustain it in this form, but the instant such air becomes chilled by contact with the window-glass in a winter's day, the water abandons the form of vapor and becomes fluid—even solid, if the glass is cold enough to freeze it. The remedy is to be found either by employing electric-light, which forms no water, or by carrying off the products of the combustion of the gas before they have a chance to come in contact with the window. Special ventilating tubes, with conical hoods over each gas-jet, are sometimes used for this purpose, but as the ordinary street-gas contains some sulphur and other impurities, sulphuric acid is formed in small quantities by its combustion, corroding the tubes if of tin or copper, and dripping in the form of blue or green vitriol on the articles beneath, which is very annoying. A third remedy might be found to a limited extent by making the glass double, so that the inside pane would not be much chilled by the outer air. But such sashes are very heavy and cumbersome, and sometimes vapor is condensed between the two glass

panes, where it is imprisoned. In fact, the electric-light offers the best solution of the case. Yours,

EDWARD S. PHILBRICK.

[On again reading the question we notice, though correct as far as it went, our reply was incomplete; we therefore gladly supplement it with the information contained in the above communication.]

GIVING OUT OF BOILER-TUBES.

93 FEDERAL STREET,
BOSTON, MASS., September 27, 1886. }

SIR: Some two years ago I placed a hot-water heating-apparatus in a large public building (about 47,000 square feet of heating-surface), using two horizontal tubular boilers with 4-inch tubes. The job works splendidly and gives the very best satisfaction, amply heating the building in the coldest weather (20° below zero), and the hot-water thermometer on the boiler standing at 180° Fah. This, you will admit, is a very satisfactory showing.

After the boilers were fired one winter, 1884-85, during the month of August following they were noticed leaking, and upon examination it was found that the tubes had given out, and a large number (some sixteen I think) had to be removed. Upon closer inspection they were found full of small holes varying in size from a pin-head upward. The holes or corrosion commenced on the fire side of the tube and worked inward toward the water side.

The boilers were kept full of water during the summer season, and it had been the custom of the fireman to burn accumulated papers and tickets in the furnaces periodically.

Often a fire would be smouldering underneath them for hours. The tubes being damp and sweating, the smoke would condense and leave a thick tarry substance in them.

After considerable investigation I traced the origin, or rather thought the cause might be in the burning of the old tickets and papers, which caused a pyrolygneous acid to form, thus eating out the tubes. We had the contents of the tubes that were taken out analyzed, and the chemist reported traces of this acid.

The burning of tickets and old papers was then discontinued, and the apparatus fired during the winter of 1885-86, doing all right, but this year the care-taker of the building drew the water off the apparatus, and a few days ago, when he was refilling it, he discovered more leaky tubes, and upon examination nine more had to be replaced.

In two other cases, lately, we have had similar experiences of the tubes giving out of horizontal tubular boilers used for hot-water heating, the shell being full of tubes and set in the ordinary way in brick-work, only there was no paper or refuse material burned under them. I might add that the boilers were all of the best material and workmanship, and tested to 150 pounds hydraulic pressure per square inch.

The kind of fuel used in firing all these boilers was soft coal of a sulphurous nature.

Will you kindly give us your opinion and views as to the cause of these tubes giving out, and if you have ever had any such cases come to your knowledge?

One of the boilers in question was only fired about four weeks, and sixteen tubes have given out. The water used in boilers is of a good quality.

Awaiting your answer, yours respectfully,

J. A. FISH.

[Pyrolygneous acids, or in fact any acid, will assist in the destruction of the wrought-iron tubes of a boiler, provided they are condensed within them. We are of opinion, however, that the trouble is primarily caused by the use of impure and sulphurous coal. The irregular pitting and eating of tubes from the fire side is unknown to us with the use of hard coal. With some grades of soft coal, however, it is a common occurrence. In your case the tubes seem to have given out in an exceedingly short time when compared with the life of tubes in a steam-boiler, but this is probably due to the fact that the mass of comparatively cold water within the boilers of a hot-water apparatus always acts as a condenser of the vapors of combustion. Bituminous and other products are always found within such tubes, principally on the lower side. When the fires are strong and the circulation of the water good this is lessened, and when the temperature of the water within a boiler passes 212°, as in a steam-boiler, or is sufficient to prevent the condensation of watery vapors, all disappears but a coke-like deposit. This in the case of a hot-water apparatus, then, is nearly at all times to be expected, but with steam-boilers the mischief or deterioration goes on only when getting up steam or with banked fires.

Try the use of anthracite coal, or some good soft coal that is known to be "easy" on boilers, and see the effect for one winter, making sure the tubes have all been restored first.

Our comment is based on our experience; still there is so much experience in the use of boilers unrecorded that we should be glad to print the views of our readers on this subject.]

TREATMENT OF SEWAGE AT LONDON, ENGLAND.

LONDON, October 2, 1886.

SIR: Under above heading in your issue of 9th ult. I note the letter of Messrs. Johnson & Co., of your city. Were the question one of opinion only, I should, of course, recognize their right to record same, and pass the letter without comment; as, however, it raises the question of facts, and disputes the accuracy of the paragraph in question in my correspondence of July 10, I ask you to give me space for reply. I purpose to record as briefly as possible the circumstances giving rise to the disputed paragraph, leaving your readers to judge for themselves as to its accuracy. At the meeting of the Metropolitan Board of Works of June 25, there was discussion relative to a tender from the Barrow-Iron Works for a vessel suitable for carrying the sludge of the precipitated sewage out to sea. The tender was accepted, and, so far as I can learn, there was, in connection with this scheme of disposal at sea, no question raised of filter-presses, which, of course, would have been an inconvenient and unnecessary factor in the scheme. Subsequently, a letter from the then Home Secretary, dated May 19, and held over for some unstated reason, came under discussion. In it Mr. Childers (the Home Secretary) said, that it appeared the Board of Works intended simply to discharge the effluent direct into the river, after precipitation at the existing outfalls. The matter being in the hands of the board, he said the board would be responsible, but the intended arrangement was not only insufficient, but full of danger to the metropolis, and that it was quite clear the board had set aside the recommendations of the Royal Commission, who pronounced this as not being permissible, save as a temporary and provisional measure, and then only at certain periods of the tide. He hoped the permanganic acid treatment would be found as effective as the board gave it credit for, but, he added, if the board disregard the commission and persevere with their proposed arrangement, they will incur an enormous responsibility. It is evident from the *agenda* paper prepared for the first meeting of the Metropolitan Board of Works this week, that they, and the Home Secretary, representing the Royal Commission, are still in opposition. A letter from the present Home Secretary, for discussion, contains the following paragraph:

"The Secretary of State wishes to remind the board of the terms of the letter addressed by him to the board on May 19 last, and hopes to learn at an early date that the board has adopted more effective and remedial measures than those now employed."

I submit, sir, that the accuracy of my statement is proved "to the hilt," seeing that, not only was the board, with its present system of sewage treatment by precipitation and disintegration—including, of course, the ultimate disposal of its component parts—in opposition to the Home Secretary in June and July last, but remain so at the present time.

It does not become me, under present circumstances, to discuss the advisability or otherwise of employing filter-presses of any kind. This is an imported factor in the question, and, without imputing, in the slightest degree, any *mala fides* to Messrs. Johnson, I would further submit that their business interest has given a bent to their interpretation of the paragraph it does not call for.

I am, sir, etc., SAFETY-VALVE.

RECIPE FOR GREEN-HOUSE PIPE-JOINTS.

BOSTON, October 13, 1886.

SIR: I herewith inclose you a recipe for making joints in green-house pipes given me by an English expert in the above work—viz.: Ten pounds of ground litherage, four pounds of best Paris whiting, one-half a pound of yellow ochre, two pounds of dry red lead, one-half an ounce of hemp cut in $\frac{1}{2}$ -inch lengths; mix well with boiled linseed oil to the consistency of thick putty; make joints in usual way. The above mixture will set quick when heat is applied. It repairs boilers, resists fire, and will set in water. Be sure the litherage is good, well-ground, and mixed together. Yours truly,

J. A. FISH.

If "Baltimore" will send his name (not for publication) his question will be answered. Anonymous communications are not replied to.

IS IT PRACTICABLE TO SOFTEN HARD WATER FOR A SINGLE HOUSE?

NEW YORK, October 12, 1886.

SIR: Being a subscriber to your paper, and in the plumbing business, I write to ask if there is any known way that can be applied to private houses by which lime and other properties contained in water supplying a house in Sharon, Conn., can be controlled or separated so that the water-back of range and the pipes connecting the same to kitchen boiler will be prevented from becoming closed up. This water has been analyzed and found to contain the following constituents. One U. S. gallon of this water:

Carbonate of lime.....	10.000 grains.
Carbonate of magnesia.....	6.080 "
Sulphate of lime.....	1.583 "
Silica.....	0.815 "
Common salt, iron, etc.....	0.225 "
	18.700 "

This water is taken from a driven well 118 feet deep, by windmill power, and pumped into a reservoir built of Portland cement and bricks. The house is supplied from said reservoir. Water was turned on the house the first of last May, and since that time I have changed the water-back of range three times, and expect every day to be called up there to put in the fourth one, owing to their becoming closed from this substance forming on the inside. This is not only annoying, but rather expensive, and unless there is some way which can practically and successfully be applied to private houses, this system of heating the water will have to be abandoned. Trusting you will let me know, either by mail or through your paper, as soon as possible; or, if you wish any further information or have any questions to ask, I will call or send the same by mail.

Respectfully yours, B. F. HASKELL.

[There are a number of ways by which a "hard" water like the one in question can be softened, but we somewhat doubt whether either of them could be advantageously employed in this case. The carbonates of lime and magnesia exist in the water as bicarbonates, being held in solution by the extra carbonic acid present. They give to the water what is called temporary hardness. Boiling the water will decompose the bicarbonates, carbonic acid being given off, and the simple carbonates separating as a fine powder or crust. If there were any practical way of thus boiling the water in a separate vessel before it was admitted to the boiler, relief would be found. We know of no appliance which has been employed on so small a scale.

Another process for softening a water consists in adding carbonate of soda or milk of lime to the water. The carbonate of soda decomposes the bicarbonates of lime and magnesia, forming a bicarbonate of soda which remains in solution, and the simple carbonates of lime and magnesia, which being practically insoluble, separate out. Where milk of lime is used, a sufficient quantity is added to unite with one-half of the carbonic acid of the bicarbonates, thus converting them into the insoluble carbonates. These carbonates are formed as a fine powder, and for their removal from the water settling-tanks or some form of filtering apparatus would be required. The lime or Clark's process last mentioned is extensively employed in some districts for softening the water-supply of a city or town, but the advisability of adopting any of these processes on a small scale would depend upon the urgency of the case.

In conclusion, we should say that it would be better to secure a different water-supply or adopt a different mode of treating the water than to attempt the softening of it by any of the processes referred to.]

Gas and Electricity.

Illuminating Power of Gas in New York City.

Week ending	New York Gas-Light Company.	Manhattan Gas-Light Company.	Metropolitan Gas-Light Company.	Mutual Gas-Light Company.	Municipal Gas-Light Company.	Krickerbocker Gas-Light Company.	Equitable Gas-Light Company.
October 16....	25.94	21.61	22.75	30.05	29.79	23.44	30.32

E. G. LOVE, Ph.D., Gas Examiner.

THE sub-committee of the Finance Committee of Philadelphia Councils has reported in favor of leasing the gas-works to a Philadelphia syndicate for twenty-five years at \$1,000,000 per year.

THE report of the Sheffield (Eng.) United Gas Company for the six months ending June 30 shows that the sum of £33,303 was expended for coal, while the revenue from residuals was £20,874; 73,620 tons of coal were carbonized, and the residuals were 45,295 tons of coke and breeze, 4,985 tons of tar, and 1,990,600 gallons of ammoniacal liquor.

"THE gas industry is of especial importance, inasmuch as it is to a wide development of this industry that we look for the abatement of the smoke nuisance and for the bringing back of vegetation into many of our towns." This is the opening sentence of the preface to a small work from the pen of Mr. J. A. Wanklyn, entitled "The Gas Engineer's Chemical Manual," published by the Scientific Publishing Company, of London. The author discusses the nature and composition of gas-coals, the composition and partial analysis of gas, following which are chapters on tar, ammoniacal liquor, and coke, and a concluding one on the purification of gas. In estimating the sulphur in coal, Mr. Wanklyn prefers to ignite the powdered coal with slacked lime, with the addition of a little chlorate of potash. Under "gas-testing" the author gives directions for determining the amount of the various impurities, together with carbonic oxide and benzene. For this he employs a "gas bottle," having a capacity of $\frac{1}{10}$ cubic foot, and provided with a hollow stopper in which the liquid reagent is placed. Objection is raised to the Referees' sulphur test on the ground that no precaution is taken to insure the complete conversion of sulphurous acids into sulphuric acid, and consequently that this method is liable to give too low results. Mr. Wanklyn adopts the plan, also suggested by the late Mr. Keates, of substituting iodine for the carbonate of ammonia, the former being placed among the glass balls in the condenser. Altogether, this manual will be found of much value to those interested in the gas industry, and especially to the gas engineer who may wish to find out for himself something of the nature of the gas and residuals produced.

Electrician says: "When the electric-light first became an accomplished fact, some fears were aroused as to the probable effect of the arc-light upon eyesight. However, according to Dr. J. A. Andrews, who recently read a paper on the subject before the American Ophthalmological Society, these fears are entirely groundless. As to the incandescent lamp, a very curious fact has been ascertained by Dr. Andrews—namely, that workers by this light who suffered from errors of refraction have found their sight to be materially improved by it."

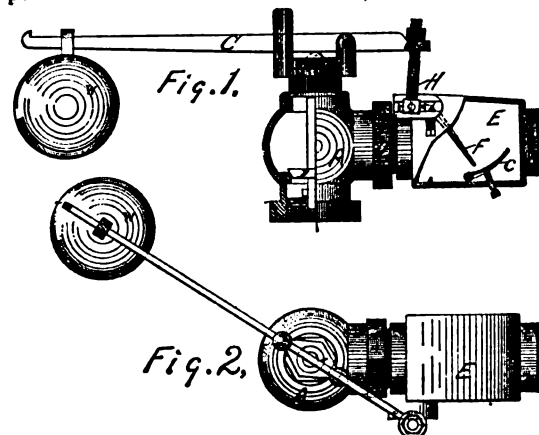
Novelties.

Under this heading we propose to describe and illustrate appliances of probable interest to our several classes of readers. The selection will be made without reference to the wishes of agents or patentees, being governed solely by considerations of novelty, ingenuity, and probable interest to readers, and especially the fact that they have not been elsewhere described. As a rule we shall make no comments, and it is to be distinctly understood that a notice does not imply approval. No charge will be made for these notices, and any offer of pay for their insertion will insure their omission. We shall be glad to have our attention called to novelties suitable for this section.

SAFETY-VALVE.

THE accompanying sketches show a novel safety-valve attachment lately patented by Mr. Gorge W. Richardson, of Boston, and assigned to the Consolidated Safety-Valve Company, of Hartford, Conn.

The present invention relates to the common safety-valve. Its principal object is to provide it with an appliance which shall cause it not only to close down upon its seat as soon as the boiler-pressure is reduced a trifle below the point at which the valve is set to blow, but also cause it to



open wider or farther from its seat than ordinarily, for the purpose of affording a more prompt and effective reduction of the internal boiler-pressure.

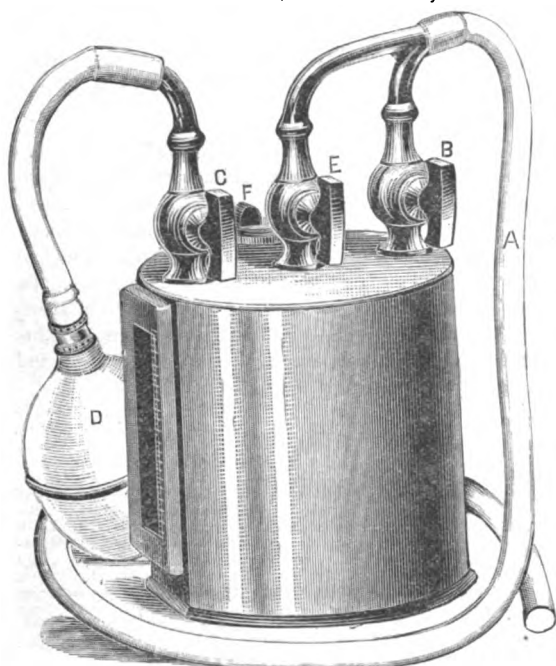
In the drawings Fig. 1 is a side elevation partly in section, and Fig. 2 a top plan. The valve is of the ordinary form, and is held to its seat by a lever C, bearing upon the projecting stem of the valve with a pressure which is regulated by a movable weight W.

D is the outlet from the valve-casing for the escape of the steam when the valve rises. In connection with this outlet is applied a chamber E, within which is a hinged valve or plate F, against which the escaping steam impinges before finding an outlet. The axis of this plate projects through to the exterior of the casing, and carries an arm or crank, which in turn is connected with the lever by means of a connecting-rod. As soon as the valve rises, the escaping steam causes the plate F to revolve upon its axis, and this pressure is transmitted to the lever through the connecting-rod, diminishing the effective force of the weight W in proportion to the pressure upon the plate F, and permitting the valve B to rise higher.

In order to regulate the power with which the damper or valve F may operate upon the lever and its weight, it is found desirable to make the connecting-rod adjustable upon the arm so that the distance of the foot of the arm from the axis of revolution of F may be varied, and thus the leverage with which the valve F operates be capable of adjustment at pleasure.

A DRAIN-TESTING APPARATUS.

THIS device is for applying the peppermint test to soil-pipes and drains in houses. The rubber tube A may be put into a water-closet and flushed through the trap, or placed in the top of a soil-pipe. The cocks B and C being opened, and the bellows D worked, the fluid is injected into the



soil-pipe. When a sufficient quantity has been injected, cock B should be closed, E opened, the bellows again operated, and the fluid all expelled from the tube A. The apparatus and tube are then left in position, and a search is instituted about the house to detect the escape of the peppermint smell, if any has occurred. The tester is made by Oscar J. Saxe, 119 Pearl Street, New York.

THE SEWAGE FARM AT SALTLEY, ENG-LAND.

(Continued from page 445, issue of October 7.)

THE method of treating the sewage as now carried on is as follows:

The sewage on arriving near the liming sheds at the upper end of the works is mixed with lime, both to neutralize the acids (present to an unusual extent in Birmingham sewage) and also to assist precipitation, which, however, is not now necessary to so great an extent as formerly; the sewage then passes through the large or roughing tanks, where the grosser impurities are precipitated, and from thence it is conveyed by the main conduit to the land, and disposed of by ordinary irrigation. The sixteen small tanks required at one time for completing the precipitation process are still used under certain circumstances, and are a valuable auxiliary when rainfall has increased the normal quantity of sewage. The sludge from the tanks is elevated by bucket-dredges and pumps into movable wooden carriers, and flows into beds formed in the land at the Saltley or Western end of the farm. The sludge contains about ninety per cent. of water as it comes from the tanks, but after lying on the ground for about fourteen days, much of this water drains away or is evaporated, leaving the sludge in a layer about ten inches thick and of a consistency that admits of its being trenched into the land. Crops are then planted, and after a time the sludge becomes pulverized and capable of being irrigated. About forty acres of

land were required for the sludge last year, and the same land may receive a coating of sludge every two to three years.

A few words may be said as to the difficulty at one time experienced in dealing with the mud from the tanks. After the construction of the first two large tanks in 1859, the mud therein deposited was dredged out and run on to the adjacent land, where it accumulated for some years, forming at one time a large mass of foul matter about seven acres in area, and over four feet deep. In consequence of the nuisance arising therefrom proceedings were taken about 1871 by the residents in the vicinity, and an injunction obtained restraining the corporation from depositing the mud so as to cause a nuisance. Great efforts were made by the corporation to reduce the amount of mud, large quantities being conveyed away in boats, but it was not until the experiment had been tried of trenching the mud into the land and found perfectly satisfactory, that the present system was adopted, about the end of 1872, and the difficulty finally overcome.

Practically, the whole of the sewage of the drainage district, amounting so sixteen million gallons per day, flows by gravitation to the outfall works. Only a very small area requires its sewage lifted by pumping, the cost of such pumping being £104 per annum.

The board farms the whole of the land, no portion of it being sublet.

Of the produce, milk is a large and increasing item, 128,995 gallons, realizing £4,406, being sold last year. During the present year about 280 acres of land are devoted to mangolds, swedes and kohlrabi; 250 acres to market-garden produce; 100 acres to Italian rye-grass; 130 acres to cereals; and about 340 acres are pasture.

The total amount realized last year from the sale of stock and produce was £20,008. During the same time stock was purchased to the extent of £7,760.

With regard to the financial aspect of the board's work, it is perhaps needless to say that a considerable sum of money has annually to be obtained from the rates. The total amount raised by the board's precept last year was £33,089, of which interest and repayment of loans absorbed £17,516; management expenses, rent, rates, taxes, etc., £5,594, the balance of £9,979 representing the loss on the year's working of the farm.

Appendix C is a detailed statement of the actual income and expenditure of the farm and works during 1885. The great loss, as will be seen from the statement, is in the work at the outlet (which comprises the lime, wages, machinery expenses, and other charges connected with intercepting and dealing with the mud from the tanks). The amount expended under this head (exclusive of rent) was £10,715, for which sum 4,778 tons of lime were provided for precipitation, and 135,476 cube yards of mud were arrested in the tanks, and dug into the land; the corresponding income is practically nil. Since the opening out of the irrigation land the expenses at the outlet have undergone some reduction, and there is every prospect not only of a further reduction in the future, but also of a gradual increase in the receipts from the irrigation land, as the demand for the farm produce is developed; but bearing in mind the large initial outlay in purchase of land and the construction of works, and the annual working expenses in disposing of so large a volume of sewage, it is not to be expected that assistance from the rates can be dispensed with until in the somewhat distant future the large annual sum now required for interest and repayment of loans shall cease. It should, however, be remembered in dealing with sewage-farm accounts that after all the great item on the credit side of the balance sheet (although it is one that cannot be represented by a money value) is the satisfactory disposal of the sewage.

In conclusion, it is only fair to observe with reference to remarks made in the first part of this paper as to the sanitary condition of the Tame Valley, that since the date then referred to considerable progress has been made in sewage-purification, Walsall, West Bromwich, Wednesbury, Darlaston, and other towns and places having taken up the question in a practical and energetic manner.

APPENDIX A.

NAME OF DISTRICT.	Area in Acres.	Estimated Population in 1885.	Ratable Value in 1885.
Borough of Birmingham.....	8,420	427,760	£1,621,701
Smetwick, Local Government District of	1,882	26,000	113,667
Harborne, " " " "	1,412	7,422	31,334
Halsall Heath " " " "	453	25,300	69,803
Saltley " " " "	1,030	7,100	47,514
Aston Manor " " " "	943	62,510	171,875
Handsworth " " " "	3,638	27,300	125,601
Aston Union, Contributory Place of	8,916	10,552	63,198
Kings Norton Union, Contributory			
Places of King's Norton and Northfield.....	3,500	15,275	84,476
West Bromwich Union, Contributory			
Place of Perry Barr.....	4,042	1,655	10,208
Borough of Sutton Coldfield.....	13,230	8,810	52,716
Total.....	47,275	619,693	£2,401,093

APPENDIX B.

OLD FARM.

Land.....	£56,337
Works, Tanks, Etc.....	91,479
Stock and Plant.....	22,728
	£170,544

NEW FARM.

LANDS.—Re Wiley's Lease.....	£1,500
" Perkins's ".....	164
" Housman (Freehold).....	6,249
" Earl of Bradford (Freehold).....	38,484
" Bagot ".....	49,498
" Newton ".....	11,173
" Goldingay ".....	3,732
	110,800

WORKS.—Main Conduit.....	£33,256
3 ft. 6 in. ".....	3,544
Laying out and Draining.....	46,979
New Buildings.....	20,119
Repairs to Old Buildings.....	590
Permanent Carriers.....	8,802

Live Stock and Farm Implements.....	113,299
	9,052
	£143,351

APPENDIX C.

Income and Expenditure from January 1 to December 31, 1885.

INCOME.			
OUTLET.			
	£	s.	d.
Sale of Manure.....	7	0	0
Pumping Sewage.....	104	0	0
Sundries.....	0	4	9
	£111	4	9

FARM.			
	£	s.	d.
Sale of Rye Grass and other Crops and Cattle Ley.....	4,960	15	10
" Milk.....	4,406	18	7
" Stock.....	10,641	0	3
	£20,008	14	8

EXPENDITURE.			
OUTLET.			
	£	s.	d.
Wages, including Lime for Disinfecting.....	9,025	12	0
Horse Keep, Veterinary Attendance, Repairing			
Harness, Carts, etc.....	356	11	6
Timber, Iron-work, Bricks, Tools, Coal, Coke,			
and Repairs to Machinery.....	1,064	14	7
Horse Hire, Boat Hire, and Tonnage.....	174	0	5
Rent, Rates, Taxes, and Gas.....	787	0	9
Miscellaneous.....	94	2	0
	£11,509	11	0

FARM.			
	£	s.	d.
Wages.....	5,047	1	5
Seeds, Plants, etc.....	508	18	11
Horse Hire, Keep, and Cattle Keep.....	4,768	14	5
Stock Purchased.....	7,760	7	6
Miscellaneous, including Tools.....	930	8	2
Rent, Rates, and Taxes.....	3,806	18	5
	£22,822	8	10

BURNING UP THE GARBAGE AT MILWAUKEE.

(From our Special Correspondent.)

By invitation of Dr. Marks, of the State Board of Health, Dr. Martin, City Health Commissioner, and B. B. Hopkins, of the Asylum Board of Trustees, visited a garbage-consuming establishment located in this city, October 11. The garbage is rapidly consumed, partly creating its own fuel. The wagons are driven on a little elevation and their contents dumped into the furnaces. They will consume sixty-five loads a day. It was agreed that it was the best solution yet arrived at as to the disposition of garbage.

PROGRESS IN THE CROTON AQUEDUCT TUNNEL.

ON the 15th two additional headings, those between the south tunnel from Shaft Zero and the north tunnel from Shaft No. 1, were successfully brought together at a distance of 1,522 feet from Shaft No. 1, and 3,335 feet from the Croton Dam. The alignment proved to have been very accurate. The last blast of dynamite in the heading from No. 1 exploded the cartridge inserted by the men in Shaft Zero.

The excavation in the tunnel south from No. 1 has reached a distance of 1,314 feet.

ANDREW CLERK.

MR. ANDREW CLERK, President of Jersey City, N. J., Gas-Light Company, died on October 13, in the 74th year of his age. In early life Mr. Clerk followed the profession of civil engineering.

For Contracting and Building Intelligence, see Supplement.

THOMAS M. CARNEGIE.

THOMAS M. CARNEGIE, of the firm of Carnegie Bros., died at his home in Pittsburgh on the 19th inst. Mr. Carnegie was born in Scotland in 1843, and came to Pittsburgh in 1847. He began life as a messenger, and subsequently entered the employ of the Pennsylvania Railroad Company, where he learned telegraphy, and later became a clerk in the Superintendent's office. In 1860 he became a member of the firm of Klonan & Phipps, operating the mill now known as the Twentieth Street Iron-Works. The firm subsequently united with the Cyclops Iron Co., the new concern being known as the Union Iron-Works. The Lucy Furnace and the Edgar Thompson Steel-Works were added to the property of the firm, and in April, 1881, the Larimer Coke-Works and Scotia Ore Mines were consolidated with the concern already controlled under the firm name of Carnegie Bros. & Co., Limited. Mr. Carnegie was made chairman of the board of directors, and held the position until his death. He leaves a family of nine children. It is reported that Mr. Carnegie's brother Andrew is quite ill at Cresson.

PERSONAL.

GENERAL JAMES C. DUANE, recently appointed Chief of Engineers, U. S. Army, graduated at West Point July 1, 1848, and appointed Second Lieutenant, Corps of Engineers. Was Assistant Instructor of Practical Military Engineering at West Point 1852 to 1854, 1858 to 1861, and was made Captain 1861. During War of the Rebellion was on duty with Army of the Potomac. Promoted Major 1863. Was Chief Engineer Army of Potomac from July, 1863, to June, 1865, participating in the leading battles of that army from 1861 to 1865. Brevet-Lieutenant-Colonel and Colonel for meritorious and faithful services in the campaign from the Rapidan to James River, and particularly for distinguished professional services before Petersburg; also, Brevet-Brigadier-General for gallant and meritorious services during siege of Petersburg. From 1865 to 1867 was engaged on defenses in the vicinity of New York, and in command of the post at Willett's Point, N. Y., and member of board for the Examination of Engineer Officers for Promotion. Served as Superintending Engineer of fort at Willett's Point, N. Y., and commanding post June 8, 1865, to June 12, 1868; appointed to charge of defenses of Portland Harbor and Forts Popham and Knox, Me., August 5, 1868; of First Lighthouse District, September, 1868, and of Second District, June, 1870; and of the Defenses of Portsmouth Harbor, N. H., May 14, 1871, to February 28, 1874; appointed as member of board on Block Island Breakwater, R. I., February 18 to March 10, 1868; member of board to reorganize the Ponton Equipage for the U. S. Army, December 19, 1868, to November 15, 1869; member of board to test stability of 15-inch gun platforms, April, 1875; member of board on foundation of Washington Monument, September 21, 1876; and as engineer of Third Lighthouse District, December 16, 1878, to October, 1886. On detached service, Engineer Third Lighthouse Districts, from May, 1879, to October, 1886. Promoted Colonel Corps of Engineers, January 10, 1883. April 12, 1884, assigned to additional duty as member and President of the Board of Engineers for Fortifications and River and Harbor Improvements. July 26, 1884, appointed member of Board of Officers for the purpose of determining the various calibres, etc., of guns and projectiles. August 13, 1886, appointed senior member of the Board of Engineer Officers to consider and report upon certain questions under Act of Congress, approved August 5, 1886, in connection with the Green and Barron River Navigation Co., Kentucky, and the Monongahela Navigation Co., of Pennsylvania.

WILLIAM BARCLAY PARSONS, JR., C. E., has been appointed Chief Engineer of Fort Worth and Rio Grande Railroad, with headquarters at Fort Worth, Texas. He retains his connection with the New York District Railway.

COL. THOMAS LINCOLN CASEY, who has been in charge of numerous works in Washington, D. C., including the erection of the State, War, and Navy Department Building, has been ordered to duty in New York City as President of the Board of Engineers for Forti-

fications, the position made vacant by the promotion of General James C. Duane to be Chief of Engineers.

COL. JOHN M. WILSON, Corps of Engineers, U. S. A., has been ordered to assume the charge of the grave of Jefferson at Monticello, Va., the erection of the Garfield Statue on Pennsylvania Avenue, Washington, the erection of a Washington Monument at Newburg, N. Y., and a new Army Medical Museum Building in Washington, all of which have until lately been under the care of Col. Thomas Lincoln Casey.

NEW CATALOGUES.

THOMAS MADDOCK & SON, Trenton, N. J., and 273 Pearl Street, New York, have issued a pocket catalogue containing colored lithographic illustrations of the various styles of decorated wash-basins.

ANNOUNCEMENT.

The publication of the sixth revised edition of the U. S. Pharmacopoeia (1880), containing as it does much more strict requirements for the purity and strength of pharmaceutical preparations, has been followed in some States of the Union by the enactment of laws against the adulteration of drugs, which laws make the Pharmacopoeia the official standard.

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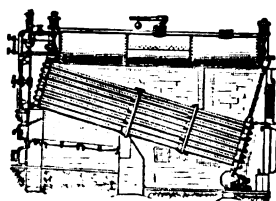
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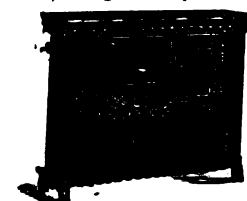
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STEAM-HEATING PROBLEMS;

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Questions, Answers, and Descriptions

RELATING TO

STEAM-HEATING AND STEAM-FITTING,

FROM

THE SANITARY ENGINEER.

With One Hundred and Nine Illustrations.

PREFACE.

THE SANITARY ENGINEER, while devoted to Engineering, Architecture, Construction, and Sanitation, has always made a special feature of its departments of Steam and Hot-Water Heating, in which a great variety of questions has been answered and descriptions of the work in various buildings have been given. The favor with which a recent publication from this office, entitled "Plumbing and House-Drainage Problems," has been received suggested the publication of "STEAM-HEATING PROBLEMS," which, though dealing with another branch of industry, is similar in character. It consists of a selection from the pages of THE SANITARY ENGINEER of questions and answers, besides comments on various problems met with in the designing and construction of steam-heating apparatus, and descriptions of steam-heating work in notable buildings.

It is hoped that this book will prove useful to those who design, construct, and have the charge of steam-heating apparatus.

CONTENTS:

BOILERS.

On blowing off and filling boilers.
Where a test-gauge should be applied to a boiler.
Domes on boilers: whether they are necessary or not.
Expansion of water in boilers.
Cast vs. wrought iron for nozzles and magazines of house-heating boilers.
Pipe-connections to boilers.
Passing boiler-pipes through walls: how to prevent breakage by settlement.
Suffocation of workmen in boilers.
Heating-boilers. (A problem.)
A detachable boiler-lug.
Isolating-valve for steam-main of boilers.
On the effect of oil in boilers.
Iron rivets and steel boiler plates.
Proportions for rivets for boiler-plates.
Is there any danger in using water continuously in boilers?
Accident with connected boilers.
A supposed case of charring wood by steam-pipes.
Domestic boilers warmed by steam.

VALUE OF HEATING-SURFACES.

Computing the amount of radiator-surface for warming buildings by hot water.
Calculating the radiating-surface for heating buildings—the saving of double-glazed windows.
Amount of heating-surface required in hot-water apparatus boilers and in steam-apparatus boilers.
Calculating the amount of radiating-surface for a given room.
How much heating-surface will a steam-pipe of given size supply?
Coils vs. radiators and size of boiler to heat a given building.
Calculating the amount of heating-surface.
Computing the cost of steam for warming.

RADIATORS AND HEATERS.

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Improper position of radiator-valves.
Hot-water radiator for private houses.
Remedying air-binding of box-coils.
How to use a stove as a hot-water heater.
"Plane" vs. "Plain" as a term as applied to outside surface of radiators.
Relative value of pipe on cast-iron heating surface.
Relative value of pipe on steam-coils.
Warming churches (plan of placing a coil in each pew).
Warming churches.

PIPING AND FITTING.

Steam-heating work—good and indifferent.
Piping adjacent buildings: pumps vs. steam-traps.
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Expansion of steam-pipes.
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Air-binding in return steam-pipes, and methods to overcome it.

VENTILATION.

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Cutting crooked threads.
Cutting a close nipple out of a coupling after a thread is cut.
Bending pipe.
Cutting large nipples.
Cutting various sizes of thread with a solid die.

RAISING WATER AUTOMATICALLY.

Contrivance for raising water in high buildings.
Criticism of the foregoing and description of another device for a similar purpose.

MOISTURE ON WALLS, ETC.

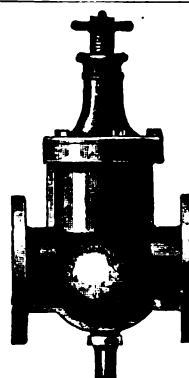
Cause and prevention of moisture on walls.
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Steam-heating apparatus in Mutual Life Insurance Building on Broadway.
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Principles of heating-apparatus, Fine Arts Exhibition Building, Copenhagen.
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On melting snow in the streets by steam.
Action of ashes street fillings on iron pipes.
Arrangement of steam-coils for heating oil-stills.
Converting a steam-apparatus into a hot-water apparatus and back again.
Condensation per foot of steam-main when laid under ground.
Oil in boilers from exhaust steam, and methods of prevention.



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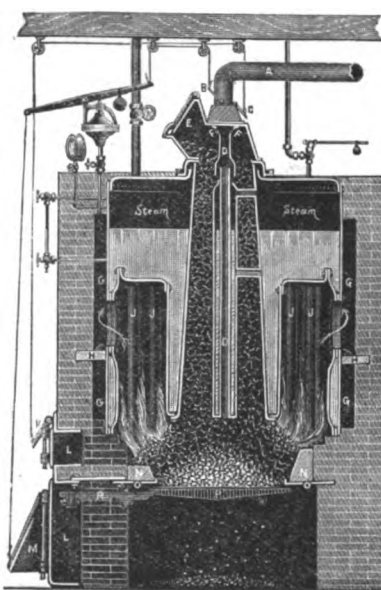


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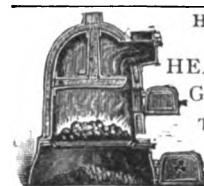


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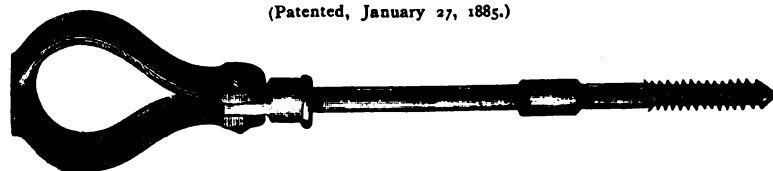
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THE SANITARY ENGINEER.

DEVOTED TO

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THE FIFTH AVENUE PAVING.

THE committee appointed by General Newton to examine the Fifth Avenue pavement have made their report, which will be found elsewhere in this issue. In this they state explicitly that there are variations from the contract, "but the differences are not such as are substantial in their nature and extent," and they "would not condemn the work as a whole, it being substantially such as is required by the contract." It should be understood that in saying this they refer mainly to that part of the work covered by certificate No. 3, to which their attention was principally confined. This examination consisted in taking up the pavement at a number of points and cutting through and measuring the depth of concrete underneath. They had not the time and they were not instructed to take any evidence in the matter; their opinion being asked solely upon what they found by examining the work. Under such circumstances, and in view of the great public inconvenience caused by the delay, the wisdom of their decision as practical men cannot be questioned. The fact, nevertheless, remains that the special legislation authorizing the work was a piece of jobbery, and its terms were intended to benefit the contractor who engineered it, but who failed to get the contract. It is only necessary to compare the specifications with those for the pavements in Liverpool for example to see how much they lack of completeness. Add to incompleteness in this regard a laxity in fulfilling them, and it is no wonder that we never have a first-class pavement in New York.

DEFECTIVE GAS-FIXTURES RESPONSIBLE FOR CASES OF GAS-SUFFOCATION.

THE *Hotel Mail*, in referring to a recent case of suffocation by gas, prints the following very proper protest:

"Two more cases at hotels this week of suffocation by gas! How long is this thing to go on? I believe half these cases are due to defective gas fixtures—to old, worn-out keys that turn entirely around when presumably turned off, and thus suffocate the poor fellows who go to bed in innocence of what is to befall them. I myself have found just such fixtures, and, too, in hotels where they charge \$4 and \$5 a day. It is a shame and a slander on half the dead who die in this way to accuse them of suicide. They are the victims of outrageous neglect and shameful economy."

Our experience in so-called first-class hotels is precisely similar to that of the *Hotel Mail's* correspondent, and in lodging-houses and third-rate hotels a better state of things is not to be expected.

THE SANITARY ENGINEER some time since called attention to the condition of gas-fixtures in hotels and lodging-houses and suggested supervision. Now that the manufacture of water-gas is increasing, and carbonic oxide is a constituent present in that gas to the extent of 28 to 30 per cent., it is high time that a systematic and regular inspection of gas-fixtures in hotels and lodging-houses be instituted by the authori-

ties. The attention of our Health Board is therefore invited to this suggestion.

MOVABLE HOSPITALS.

THE utility of cheap barrack hospitals has been so thoroughly demonstrated within the last twenty-five years that it is now generally admitted that for caring for the sick and wounded of an army during war, and also as emergency hospitals in cases of epidemics, or for men engaged in large engineering operations, they give far better results than can be obtained in buildings such as dwellings, warehouses, churches, etc., which were formerly the chief resort in cases of emergency.

Attention having once been called to the possibility of making sick men comfortable in comparatively slight and cheap buildings, and even in tents, attempts have been made within the last ten years to perfect some system of hospital construction which should permit of the moving the buildings rapidly from place to place to meet the wants of an army in the field, or to be used in cases of great accidents or epidemics.

These attempts were greatly stimulated by a competitive exposition of plans for such hospitals held in Antwerp in September, 1885, under the stimulus derived from the Empress Augusta of Germany.

The report by the German members of the Jury of Award upon the various plans submitted at this exposition is a very valuable and interesting document, and gives details as to a large number of the plans submitted. The conditions under which plans were submitted were mainly the following: Each barrack to be of a size sufficient for twelve beds, allowing not less than twelve cubic metres of air-space per bed. The buildings to be so constructed that they can readily be put up and taken down by unskilled labor, and can readily be transported on wagons or on railway-cars. They must be comfortable in winter as well as in summer, must be provided with means of heating, and with latrines. They should be fire-proof if possible, and capable of thorough cleansing and disinfection. Comfort, mobility, weight, and cost were the points chiefly to be considered.

In response to invitations to compete under these conditions, sixty plans and models were submitted, besides several of what are called wagon barracks, or barracks on wheels.

One of these was made entirely of iron, having double walls, weighed about 11,000 pounds, and cost about \$600 complete.

Eleven of the plans contemplated an iron frame-work covered with various materials such as asbestos, linoleum, rock-wool, and canvas, cork, paste-board, wood, etc. The weight of each of these varied from 30,920 to 8,382 pounds, and the cost from \$1,400 to \$385.

Of simple wooden structures there were four specimens, varying in cost from \$440 to \$750 each.

Eighteen plans were presented for a hospital barrack to consist of a wooden frame-work covered with various materials such as corrugated

iron, paste-board, etc., the material most used being canvas. The lightest and cheapest of all is one submitted by Mr. Ducker, of New York, the weight of which is 2,640 pounds, and the cost about \$300.

Details as to the construction for all the various plans, with illustrative plates, will be found in the report of the committee, which forms the fourth number of Vol. 33 of the *Archiv für klinische Chirurgie*.

The first prize of 5,000 frames and a gold medal was awarded to Christoph & Unmack, of Copenhagen, for a movable barrack hospital constructed according to what is known as Döcker's system. This barrack is a wooden frame covered with a double layer of paste-board sheets about three feet wide and seven feet long. The ward is ten metres long and five metres wide. The whole weight, including stove, etc., is 3,490 kilograms, and the cost \$750. A silver medal was awarded to the plan of Mr. Ducker, of New York.

gress, lately paid a visit to London-yard, Poplar, where Messrs. Westwood, Baillie & Co. are erecting the bridge, known as the Sukkur Bridge, for the Indian Government. It not being possible to erect scaffolding on the site where the bridge will ultimately have to be put up, the structure is being fitted together here before shipment. The extreme height of the bridge is 173 feet; it is built upon the cantilever principle, somewhat similar to the Forth Bridge. The bridge measures 790 feet between the centre of the abutments, will carry a single line of rail of five feet six inches gauge, and is entirely constructed of mild-steel plates and bars from $1\frac{1}{4}$ -inch to $1\frac{3}{4}$ -inch in thickness, fastened with steel rivets. The designer is Mr. A. M. Rendell, and the total weight is 5,000 tons.

For some time past there has been trouble at Hendon, in Middlesex, over the disposal of their sewage. Of the entire merits of the controversy I am not fully acquainted, but the following extract from a letter of Sir Robert Rawlinson, Chief Government Inspector and adviser to the Local Government Board, to Mr. C. F. Hancock, is worth publishing, as it gives advice that may well be heeded by

had ever been passed in relation to gas undertakings. "The result of it has been to cause a vast improvement in gas manufacture, a general lowering in the price of gas, and a raising of dividends."

The statement of accounts of the Commercial Gas Company of London, for the six months ending June 30, show that 90,757 tons of coal were carbonized, of which 3.95 per cent. was Cannel. The make of gas per ton of coal was 10,120 feet, of which 93.71 per cent. was sold and 5.19 per cent. unaccounted for. The residuals per ton of coal carbonized were 1.31 chaldrons of coke, 10.36 gallons of tar, and 39.98 gallons of ammoniacal liquor. The company was obliged to draw about \$10,000 from its "undivided profits" in order to pay the $10\frac{1}{2}$ per cent. and $13\frac{1}{2}$ per cent. dividends recommended.

A regular epidemic of fatal accidents, resulting from injudicious and careless use of kerosene-lamps, has lately occurred here. The most frequent cause of disaster appears to arise from the foolish custom of turning such lamps down low, and then blowing them out through the medium of the chimney. The result is that the contents of the reser-



RESIDENCE OF S. T. PICKARD, PORTLAND, ME.—J. CALVIN STEVENS, ARCHITECT.

CINCINNATI ASPHALT PAVEMENTS.

THE Cincinnati *Commercial Gazette*, in quoting the editorial in THE SANITARY ENGINEER of October 14, in which we quoted the statements of a citizen of that city concerning the new asphalt pavement recently laid, says: "The part of this which is so is the concentration of travel on Race Street. The pavement has not been well cleaned, however, and cannot be until the police club the sprinkling-carts from the street. The one salvation in having asphalt pavement is in having it well swept every night."

OUR BRITISH CORRESPONDENCE.

The Sukkur Bridge—Hendon Sewage Disposal Controversy—Sir F. J. Bramwell on the Sliding Scale of the English Gas Companies—The Commercial Gas Company—Kerosene Lamp Accidents.

LONDON, October 9, 1886.

THE members of the Society of Engineers and their friends, to the number of about fifty, in pursuance of their scheme of visiting works of interest which may be in pro-

any community that has sewage to dispose of: "I hope your board will retain the treatment in their own hands, until the experiment has been fairly worked out honestly by your own engineer. This is your board's only safe course. Can any person of common sense believe that contractors for treating sewage have any motive but personal advantage? I can tell you they have not; and if by agreements you entered into a contract which proved not to be profitable to the contractors, your works would come back in a deteriorated, if not ruined, condition, and you might have actions for damage by pollution to pay for. My advice is—listen to no would-be contractors for sewage treatment. The house-drainage, to make the sewers of their fullest use, must be well looked to. Do this and the landed and house property of Hendon will have value added, more than the costs of the main-drainage and house-drainage works."

Sir F. J. Bramwell, in his testimony before the House of Lords Committee on the proposed amendment of the Electric-Lighting Act, speaking of the sliding scale as applied to English gas companies, said he believed it had been one of the most beneficial pieces of legislation that

voir becomes ignited and the lamp bursts, causing damage to the person either by burning or flying glass. A word of warning to the users of such lamps, calling attention to the volatile nature of the fumes given off by the oil, of consequent ease of ignition, may not be amiss.

SAFETY-VALVE.

A MEETING of the Works Committee of the Dundee Water Commissioners was held recently for the purpose of taking steps for the construction of a duplicate line of water-pipes through the valley of Strathmore. Some time ago the committee recommended that a second line of pipes should be laid along the valley, and a remit was made to them to bring up a report as to the cost, with the relative plans, schedules, etc. Mr. D. Russell Duncan, of London (formerly of Dundee), attended the meeting, and showed some samples of steel pipes patented by him. He claimed a superiority for the steel pipes in point of strength, durability, and cost, and mentioned that they were now being largely used in preference to cast-iron pipes in England and in America. With the view of testing the pipes, Mr. Watson arranged to have one tested under hydrostatic pressure to 1,000 feet, and to lay two lengths in the streets so as to gain practical experience of their value as water-mains. The committee thereupon adjourned further consideration of the matter.—*Journal of Gas-Lighting*.



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RESIDENCE OF H. M. KNISLEY, CHICAGO.—BURNHAM & ROOT, ARCHITECTS.

THE subject of our special illustration this week is the residence of Mr. H. M. Knisley, of Chicago. The front is of brick tiles and terra-cotta. Stone steps and basement. The interior finish is of hard wood. The architects were Messrs. Burnham & Root, of Chicago.

OUR ILLUSTRATION OF A MODERATE-COST HOUSE.

RESIDENCE OF S. T. PICKARD, PORTLAND, ME.—JOHN CALVIN STEVENS, ARCHITECT.

OUR vignette illustration shows the residence of Mr. S. T. Pickard, editor of the *Portland Transcript*, on Congress Street, in Portland. The underpinning is of rough stone, with brick jambs. The walls of the first story are of clapboards, above that of shingle. The hall is finished in cherry, the main rooms in white woods stained and polished. The attic is arranged to give three good chambers. The cost was about \$6,700. The architect was Mr. John Calvin Stevens, of Portland.

SHORT ROOFS AND HALF-TIMBERED GABLES.

(From our Special Correspondent.)

CHICAGO, ILL., October 7, 1886.

MEETING Architect John W. Root, I asked him what he thought of the communication in *THE SANITARY ENGINEER* of September 30, signed "Civil Engineer," criticising, among other things, the expansiveness of roof in summer villas of the day. "Nothing is truer," the gentleman replied, "than the fact that in all inclement climates the most vital element of external expression is the roof. Mr. Ruskin has called attention to the fact that in rain or snow an open shed with a good roof is better protection than four solidly built walls without one. For this reason, the natural development of architectural types, in warm climates like those of Italy, Spain, and Palestine, causes the roof to be universally treated in a subordinate way, frequently not showing at all, and this not only for the reason that the roof is frequently used in part for habitation, but because in climates where thorough protection from inclement weather is so needless, a strong expression of the roof was not felt to be necessary. In Russia, Sweden, Denmark, and all other countries where cold weather prevails through a large part of the year, a natural development has resulted in the evolution of large roofs, showing that instinctively and without the imposition of outside influences the roof expression of the house is felt to be essentially interwoven with conditions of climate. For this reason nothing is more natural and more proper than that in a climate like ours, all that is to be expressed of protection and shelter which the roof is capable of expressing, should be put into the design of our houses, 'C. E.' to the contrary notwithstanding. Of course, if the lines of the roof are so broken up and its general masses so intruded upon by all sorts of small dormers and other apparently adventitious features, that even a lay observer feels the difficulty of its construction and its tendency to admit water freely at all its various joints, the roof will fail in expressing exactly the idea it was intended to convey. But when the broad principle is laid down that the frank expression of the roof can be made to convey the desired sense of shelter, then, without straining the idea into false channels, the inherent motive and value of the roof can be readily seen. It is true that ours is not only an arctic, but in a certain respect, a tropical climate, and for one of these reasons as well as the other there should be an intervening air-space between the exterior roof and the interior ceiling of every building. If the roof of the building is also its ceiling, it does not matter whether the roof has a low or a high pitch, the result is practically the same. And, in general, it might be stated that the flatter the roof the hotter, for the reason that the sun's rays fall more perpendicularly upon a horizontal than upon a vertical surface; or, in other words, for the same reason that makes the weather hotter in summer than winter. No mathematical engineer on the one side nor poetical idealist on the other is able to interfere with the

evolution of essential architectural ideas, especially in this transitional period of the science. The fruitful periods of architecture are its transitions. There are comparatively few fruitful ideas to be gained from the finished Parthenon or from Cologne Cathedral, but at Amiens, Bauvais, and in much magnificent transition work in the south of France, there is immense suggestiveness."

ENGINEERS' REPORT ON THE FIFTH AVENUE PAVING.

To Gen. John Newton, Commissioner of Public Works:

SIR: The undersigned were constituted by you a board of experts to examine and report upon certain matters concerning the character of the work performed under the contract of the city with Matthew Baird for the paving of Fifth Avenue.

We are in receipt of general instructions from you of date October 12, 1886, together with letters and papers of subsequent date, calling special attention to the character of the work at various points noted therein.

Our examinations were mainly confined to the area stated as covered by the third certificate of seventy per cent., with the addition of the special points above referred to. The area covered by the seventy per cent. certificate was understood to be as follows: From Fiftieth to Fifty-eighth Street and from Seventy-ninth to Eighty-third Streets, embracing several items of work, and from Forty-seventh Street to 100 feet north of Fifty-fourth Street, with special reference to the paving, and from Forty-eighth Street to Fifty-fourth Street for the bridging.

Q. The question raised involves a consideration of a nature of any variations from the contract that may exist, and of their extent and importance considered relatively to that part of the work mentioned, as a whole. In other words, is the work now done by Mr. Baird, and which will be covered by that certificate, such as is required by the terms of his contract? If it is not, does it differ therefrom in such particulars as are substantial in their nature and extent?

A. There are variations from the contract which exist, but the differences are not such as are substantial in their nature and extent.

Q. You will please report to me whether or not, in your opinion, the work already done on the avenue, and which would be covered by such certificate, considered as a whole, is substantially such as is required by the contract, or whether you find in the places indicated such variations from the contract as, in their nature and extent, would condemn the work which would be covered by such certificate, as a whole, as not being substantially such as is required by the contract?

A. The variations would not condemn the work as a whole, the latter being substantially such as is required by the contract.

Our examinations have been as thorough as we considered necessary to exhibit the character of the work, and from which we were enabled to form the opinion that in accordance with the contract the construction has been carried on "in a good, firm, and substantial manner," and we have, as requested by you, reported that simple fact.

Respectfully submitted,

(Signed) WILLIAM E. WORTHEN,
JULIUS W. ADAMS,
ROBERT VAN BUREN.

A COMMITTEE of the Fredonia, N. Y., Water Commissioners have recommended that all water used for mechanical purposes and irrigation shall be sold by measure only, the use of meters to be made compulsory. The rate to be from 9 to 7 cents per 1,000 gallons daily, according to quantity, with a minimum charge of \$10 per year for business places, and \$5 for private houses. They ought to go farther and compel all consumers to have meters. The system of guess-work water-rates for private houses and meters for large establishments is exactly like a coal-dealer charging his small customers so much a year for all the coal they can carry away, and his larger customers so much a ton for what they get.

THE BOSTON SOCIETY OF ARCHITECTS.

THE last regular meeting of the Boston Society of Architects was held at Revere House, on Friday, October 29, at 7:30 P. M., for the annual election of officers. Mr. C. H. Blackall, the first Rotch traveling student made a report and exhibited drawings.

THE TUNNEL UNDER THE RIVER MERSEY AT LIVERPOOL.*

No. IV.

(Continued from page 494.)

THE hydraulic lifts were manufactured by Messrs. Easton & Anderson, M.M. Inst. C. E., and they are, it is believed, the largest passenger lifts yet constructed.

To secure safety they are direct-acting rams working at low pressure, requiring wells 40 inches in diameter and 90 feet deep to be sunk into the rock, for the reception of the lift-cylinders. This was done in Liverpool by Messrs. Mather & Platt, of Salford, and in Birkenhead by Messrs. Timmins, of Runcorn.

The method adopted by Messrs. Timmins was to bore a hole, 18 inches in diameter in the first instance, to a depth of 90 feet. The hole was then carefully plumbed to ascertain if it was in any degree out of truth, and if so to what extent. This decided the size of the widening-out bar. It was then increased in diameter to 40 inches. The plumbing of the holes gave rise to a good deal of thought, owing to the wells being in all cases full of water.

This was suspended from a point 95 feet above the top of the well, cross-strings being carefully fixed, as at *a b* in Fig. 1.

If the plumb-bob in its descent to the bottom of the well encountered any irregularity, the exact amount could be calculated by the travel of the plumb-line at the cross-strings. In the case of the Liverpool wells the plumb-bob used consisted of a double cone 3 feet in length, and was 39 inches in diameter. The three wells which were sunk at James Street Station were bored by Messrs. Mather & Platt's earth-boring machine, to the full diameter of each well—namely, 40 inches, being bored at one operation. The bar when boring obtained the necessary percussive motion from the steam percussion-cylinder of the boring-machine, and after working a sufficient time in the bore-hole, was withdrawn by means of a winding engine, also attached to the machine. The shell-pump was then lowered by the same winding engine, and by it the material broken up by the cutters of the boring-bar was withdrawn. These operations were successively performed until the required depth of the well was reached. Each of the holes when completed was perfectly round and plumb. In No. 1 well, boring was commenced on the 23d of March, 1885, and finished on the 11th of April. The depth bored was 76 feet 6 inches. The number of days occupied in boring was eighteen, and the average depth bored per working day was 4 feet 3 inches. The boring of well No. 2 was commenced on the 20th of April, 1885, and finished on the 5th of May. The depth bored was 76 feet 9 inches. The number of days occupied in boring was fourteen, and the average depth bored per working day was 5 feet 6 inches. No. 3 well was commenced on the 25th of May, and it was finished on the 8th of June, 1885. The depth bored was 76 feet 10 inches, the number of days occupied in boring being thirteen. The average depth bored per working day was 5 feet 11 inches, and the work was carried on night and day. At Hamilton Street Station the wells were also 40 inches in diameter, but the depth was about 88 feet in all cases, the work being carried out with a heavy cutter, which was raised by means of the friction of a rope on a constantly revolving drum. By slacking the end of the rope which was held by the man in charge, the friction was reduced and the tool dropped. This method required far less preparation than that adopted at Liverpool, but there was little difference in the date of the completion of the wells at the two places.

The author prefers wells to borings on account of the difficulty in boring the latter plumb.

The rails are 92 feet below street-level in Liverpool and 103 feet in Birkenhead.

In each of the stations there are three lifts, each arranged to accommodate one hundred passengers at a time. The time occupied on the vertical journey is about forty-five seconds, so that a train-load of 300 passengers can be brought from platform-level to the surface in one minute. The lift consists of a room, or cage, 20 feet long, 17 feet wide, and 8 to 10 feet high, with seats on each side, and is fitted with handsome paneled sides of teak and American ash, and with a lantern roof surrounded by mirrors, with a central gas-lamp.

The motive power is water at a low pressure derived partly from a tower tank holding 10,000 gallons, and

* "The Mersey Railway," by Francis Fox, M. Inst. C. E.; and "The Hydraulic Passenger-Lifts at the Underground Stations of the Mersey Railway," by William Edmund Rich, M. Inst. C. E.

partly from steam pumping-engines discharging direct into the lift supply-pipes.

On the downward journey the water is discharged into the underground waste-tank, from which it is pumped back to the upper tank by the engines. The lifts at James Street have a stroke of 76.6 feet, and those at Hamilton Street of 87.7 feet, and in consideration of the greater traffic which may be always expected at James Street, there are at this station three boilers and three sets of pumping-engines. The booking hall at James Street on the ground floor is 46 feet long, 33 feet wide, and 19 feet high. On the south side are entrance doorways to the A and B lifts; and on the north side are doorways leading to the C lift, and a flight of stairs which also leads to the lower hall 76.6 feet beneath (Figs. 20, 21, and 22).

The engine-room is intermediate between these two floors, being at a height of 27.2 feet above the lower hall. The remaining space between the engine-room and the booking-hall floors is occupied with floors for luggage, stores, porter's room, etc.

The lower hall is very similar in plan to the booking hall above. On the east side are two open arches about 12 feet wide. The most northerly of these leads by a flight of broad winding steps to the up-line platform at a level of 12 feet 10 inches below the lower hall floor. The other arch gives access to the down platform on the opposite side of the tunnel station by means of a lattice girder footbridge.

The station buildings are carried up to a considerable height above the booking hall, and will probably be let out in offices. A tower rises above the main block of buildings, and contains at its upper end the top tank, 15 feet 6 inches diameter, 9 feet deep, which holds 10,000 gallons of water. The waste-tank of similar capacity is excavated out of the rock beneath the engine-room floor, and lined with brick in cement (Fig. 19).

The several lifts are contained in rectangular vertical shafts, 21 feet long and 19 feet wide, partly excavated out of the solid red sandstone rock, which stands with clean dry vertical surfaces without lining, and partly enclosed in walls of brick in cement, which separate the shafts from one another, and from the engine-room, booking hall, etc.

Each shaft descends to a depth of 8 feet below the lower hall floor, and rises to a height of about 20 feet above the upper booking-hall floor. On each side of the shaft four vertical rows of

wooden bricks, Figs. 23, 25, and 26, are fixed in the walls with thin folding wedges. These bricks are cut of pine sleepers, of a section 10 inches by 5 inches, and they are let into the walls, and project outward from the faces of them. They are spaced at 5 feet apart vertically from centre to centre. To these wooden bricks eight lines of rails are attached with coach-screws; four of these rails serve for guiding the cage, and the remaining four for

guiding the counterweights. These rails are of steel of the section shown in Figs. 23 and 27, and are in 15-foot and 10-foot lengths, connected by fish-plates. They were all specially straightened, and fixed accurately to gauges, so as to form very true guiding surfaces. The advantage of the V-shaped guiding surfaces is that the guide-brackets which slide over them can be efficiently adjusted as they wear, by packing them out in one direction only.

The cast-iron lift-cylinders are 21 inches in internal diameter, Fig. 28, and 1½ inches thick, with strongly bracketed flanges, 29 inches in diameter, and they are bolted together in 12-foot lengths, with sixteen bolts 1½ inches in diameter to each joint, and suspended in the boring from the top length, which is furnished with a large bell foot, 4 feet 8 inches in diameter, which rests on the floor of the lift space. This top length also has a tee-branch on the front side, for connecting it with the starting-valve, and at its top end it is bored out 18 inches in diameter, and fitted with a hat-shaped leather for making the joint round the ram. The ram, which descends into the cylinder, is 18 inches outside diameter, and ½-inch finished thickness, constructed of mild steel tubes, in lengths of about 11 feet 6 inches. These tubes are turned and polished, and connected together by internal screwed

ferrules, 6 inches long, and 15¼ inches internal diameter, the screw-threads being eight to the inch. The bottom end of the ram is a tough heavy casting, with hemispherical bottom, and as an additional security, rods 1½ inches in diameter at the smallest part are attached to this bottom casting, and carried up the centre of the ram so as to securely grasp the boss of the main cage-cross at its top end.

The tubes for these rams were forged by Messrs. James Russell & Co., of Wednesbury, from Landore-Siemens steel plates, ¾-inch thick. They were lap-welded in short lengths of a few inches at a time under a hydraulic press. The steel was tested by Professor Kennedy, and was found to break with a load of 63,000 pounds per square inch, the average extension being about 29 per cent., and the contraction at the point of fracture 47 per cent. The ram preserves its uniform diameter of 18 inches to its top end, and there enters the boss of the steel cage-cross, and is attached to it with four 1¼-inch turned bolts with nuts and guard-pins.

The cage-crosses, which are shown in Figs. 24 and 27, were forged by Messrs. Clay, Inman & Co., of the Birkenhead Forge, and are considered very fine specimens of complicated steel forgings. Each cross in its finished

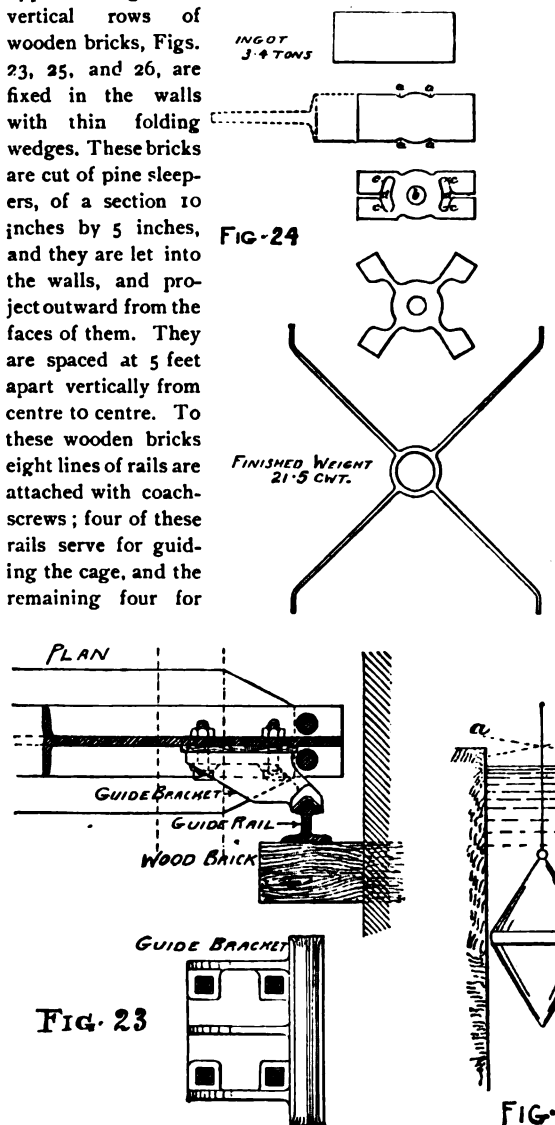


FIG. 23

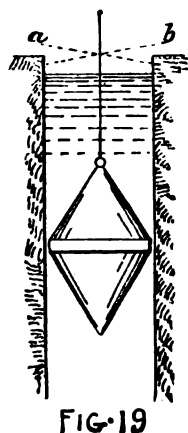


FIG. 19

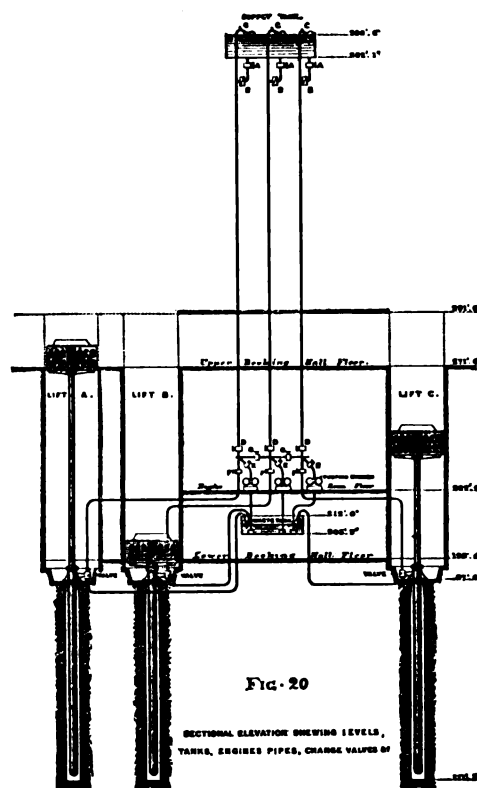


FIG. 20

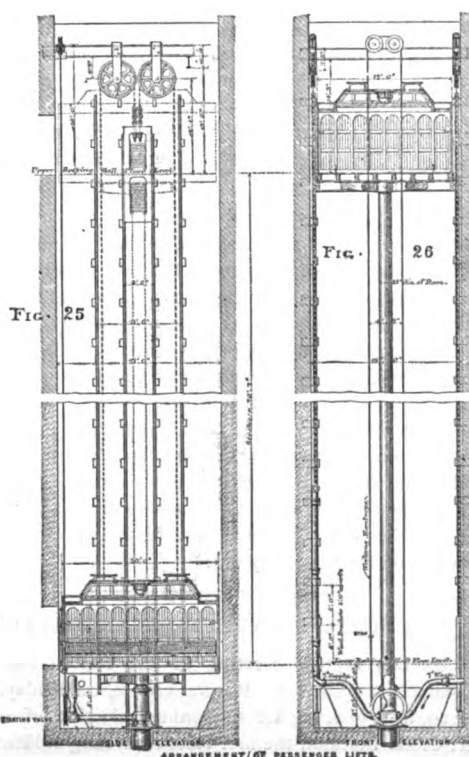
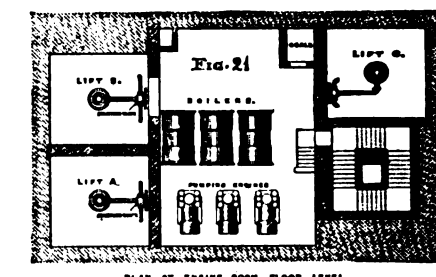
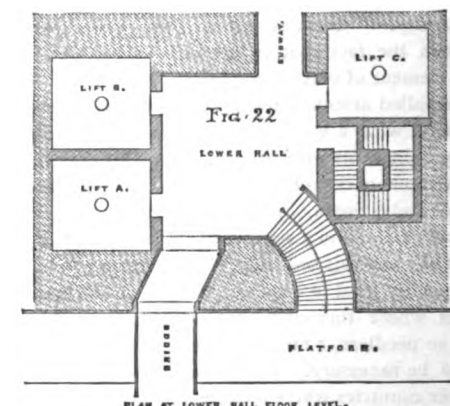


FIG. 25

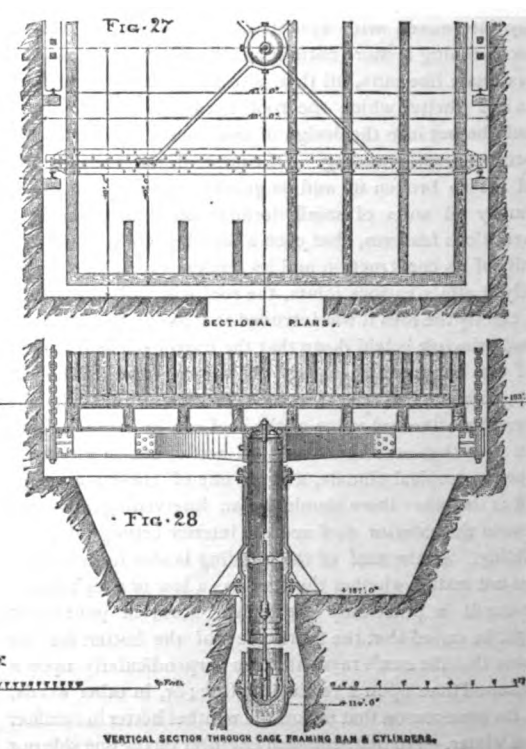
FIG. 26



PLAN AT ENGINE ROOM FLOOR LEVEL.



PLAN AT LOWER HALL FLOOR LEVEL.



SECTIONAL PLANS.

FIG. 28

VERTICAL SECTION THROUGH CAGE FRAMING RAM & CYLINDER.

state weighs $21\frac{1}{2}$ cwt., and was forged out of an ingot weighing originally about 3.4 tons, supplied by the Steel Company of Scotland. Mr. Salmon, the managing director of the Birkenhead Forge Company, has furnished the author with the outlines of the successive stages by which these crosses were forged (Fig. 24). He made a great point of discarding as a matter of course several inches of the original ingot near its top end, and before anything was done the side surfaces of the ingot were carefully examined, and any parts showing a spongy texture or surface cracks were cut away by milling or slotting machines. In the first place the ingot was drawn out under the hammer, and dented at *a a*. Secondly, the holes *b c c* were drilled, and the pieces *d d* slotted out; next the arms were drawn out straight to their full length; then the boss was bored, and its outside edges and the junctions of the arms with it were neatly slotted round. Finally the arms were bent away to form the feet, and the faces of these feet were planed off to gauge. Each cross measures 9 feet $6\frac{1}{4}$ inches wide over the feet, and 11 feet long, and the boss is 15 inches deep and 2 inches thick. The arms are 2 inches thick near the boss, and $1\frac{1}{4}$ inches thick, and 11 inches deep at their outer ends. The cross is riveted by means of the four feet at the ends of its arms to the vertical webs of two thick English rolled joists of H section, 18½ feet 8 inches long, 14 inches deep, and 6 inches wide; and these girders are further strengthened by riveting on to their top and bottom flanges iron plates, 12 inches wide, $\frac{1}{2}$ -inch thick.

These foundation girders are laid transversely beneath the lift-cages, and are extended beyond their sides, to enable the counterbalance chains to be attached at their outer ends. The floor of the cage or ascending room consists of eight pitch pine joists, 10½ inches deep, those at the sides being 5½ inches thick, and the others 3¾ inches thick. Each of these is attached to the top plates of the main girders mentioned above by four stirrups of ¾-inch iron, screwed at the ends, and fitted with nuts beneath the flanges. At the front and the back of the cage these wooden joists are mortised into transverse timbers of the same depth as themselves, and 5½ inches thick. A teak floor, 1¼ inches thick, is laid on this timber framing, and the sides and ends of the cage formed of teak frames, 3 inches thick, with American ash panels, ¾-inch thick, are built upon it.

The roof of the cage is also paneled, with looking-glasses in the inclined panels to reflect the light of the central gas-lamp downward. For a width of 2 feet round the sides the roof is of extra strength, having double boarding, so as to form a good gangway for inspection of and access to the working gear, and to support any loads which it may be convenient to lay upon them, in the case of overhauls or replacing chains, etc. There are spline seats on each side of the cage, and on the front side is the doorway, 4 feet wide, with sliding door fitted with clear glass panels.

The ornamental panel-work was designed by Mr. Grayson, of Liverpool, the architect for the station buildings, and the woodwork of the cages was constructed by the Starbuck Car Company, of Birkenhead.

Above the lift-cage, at the top of its stroke, two Butterley rolled joists, 16 inches deep and 5½ inches wide, span the lift-space crosswise, and on the ends of these, at a distance of 5 inches from the walls, two other joists of the same section are seated and securely bolted to them. From each of these side girders two chain pulleys, 4 feet 8 inches in diameter, are suspended by means of stirrups of forged plate-steel, with central turned bolts, 3 inches in diameter, furnished with trebly secured attachments at their ends.

Between each pair of pulleys a counterweight is suspended by two 1½-inch short link chains, with an eye-bolt and double nuts at one end of each, for attaching it to the weight.

Each main weight weighs 7,620 pounds, and is fitted with recesses for receiving thirty-nine or any smaller number of weights of 90 pounds each for balancing the lift; these may be very easily put on or removed by an attendant on the cage top.

The chains pass over the pulleys above mentioned, and are attached by long U-shaped shackles and cotters to the ends of the cage-girders.

It is noteworthy that no ordinary shackle will pass through the links of short-link chain. With these, however, a chain can be cut anywhere, and attached more securely than with common shackles, which the author considers weak and unreliable devices for such responsible duties. The lift starting-valve is placed on the bottom floor of the lift space vertically, beneath the cage door; it consists of a gun-metal slide-valve, working on a cast-iron face. The sup-

ply port is shaped so as to enable the valve to be closed and opened without causing sudden shocks in the water, and through it to the lift-ram. The valve is actuated by a pinion working into the teeth of a rack cast on the back of the slide. The pinion is cast in one with the spindle, which passes through two stuffing-boxes in the sides of the cover, and is operated by a 4-foot rope-wheel on one end of it (Figs. 25 and 26).

A large self-acting flap valve admits water automatically to the lift-cylinder from the exhaust, if the starting-valve is closed too suddenly during the ascent of the lift; and as the full stroke of the hand-rope from full pressure to full exhaust is nine feet, it is found that the lift starts and stops with great quietude and comfort to the passengers. A lock on the hand-rope in the cage prevents any unauthorized person from actuating the starting-valve.

The boilers are of the return-tube type, each 6 feet 6 inches in diameter, 11 feet long, with a single flue 3.0 feet in diameter, and 3-inch tubes. They are constructed of mild steel plates, and are loaded to 60 pounds per square inch on the safety-valves.

The pumping-engines are high pressure of the duplex type, each with two steam-jacketed cylinders 11 inches in diameter, and 20 inches length of stroke, working direct off their piston-rods, two double-acting piston pumps 7½ inches in diameter, and 20 inches length of stroke. The slide-valve of each cylinder is worked by a lever from the piston-rod of the other, so that there are no dead centres, and they are so arranged that the pistons cannot strike the cylinder ends. So long as the gross pressure on each steam-piston exceeds the resistance against the pump-piston, due to the water-pressure against it, together with the friction of the working parts, these engines will keep working, pumping water from the waste-tank into the system of pipes, which connects the top tank with the lifts. Any reduction of pressure in the pumps increases the speed; but immediately the above pressures and resistances are equalized, either by closing a valve on the delivery side of the pumps, or in any other way, the engines stop "dead." They start again, however, automatically at full speed, directly the resistance to the pump action is relieved by opening the valve or otherwise, even though they may have been standing for hours in the interval. The valve or other resistance may be any distance, even miles off. As there is very little inertia in the working parts, the pressure against the pumps may be put on or taken off with the greatest rapidity without injury to anything.

These engines were manufactured by Messrs. Easton & Anderson, MM. Inst. C. E., and engines of this type have been used by them during the last twenty-five years for a great variety of purposes, such as water-works with and without reservoirs, naphtha-pumping through long mains, working lifts, hydraulic presses, riveting plant and gun-carriages, and as bilge-pumps and fire-engines on board ship. Their details and proportions have been considerably varied and improved by "natural selection," as a matter of course, in the interval, but the original principle remains.

Each set of engines at the Mersey works is proportioned to give a hydraulic pressure of about 1.6 time the boiler pressure when discharging 500 gallons per minute, rising to 1.9 time that pressure when working "dead slow." Pending the completion of the tower for receiving the top tank, the several lifts at James Street have been worked so far direct from these engines without any supply tank. The steam stop-valves on the engines are left wide open from morning to night, and their action is entirely controlled by the lift starting-valves. There is an air-vessel on each set of pumps, and a small one on each lift-valve, and these suffice to neutralize all irregularity of flow, so that no pulsations are noticeable in the lifts.

The normal duty of the engines is to automatically keep the top tank full, and to assist it to work any lift whose starting-valve is open for ascending. In case of an excessive load beyond the powers of the tank pressure to deal with, the engines immediately take the entire duty of raising the lift so loaded.

The system of main-pipes and of change-valves between the tanks, pumps, and lifts, is shown in skeleton in Fig. 20. Three 7-inch mains descend from the tank-bottom to the several lifts, one to each.

Beneath the tank these pipes have sluice-cocks, A A A, and self-acting valves, B B B, which prevent flow through them toward the tank. Branches beyond these lead to ball-valves, C C C, for supplying the tank and shutting off the water when it is full.

In the engine-room multiple crosses are introduced in these mains, with branches to the pumps and connections between the several main pipes, and eleven 7-inch sluice-cocks so arranged that the engineer in charge can readily shut off any tank-main with the cocks D D D, or any pump with the cocks E E E, or any lift with the cocks F F F, still leaving everything else at work. With the cocks G G on the junction pipes he can cut off the connection between the mains, leaving each lift system complete in itself, with its own tank main and pumping-engine. In normal working, however, it is best to leave them and all the other cocks fully open, as each lift then gets the benefit of all three supply mains and all the pumping-engines which may be under steam at the time. There is no doubt that the concentration of these change-cocks and mains, in accessible positions, and in a symmetrical and intelligible order, will prevent many mistakes on the part of the attendants.

Donkey-engines of the small duplex type are to be added shortly, and short-stroke unbalanced ram-lifts are to be fixed on the platforms for raising luggage to the foot-bridges, from which the trolleys can be easily wheeled into the large lifts. Small hydraulic ash-lifts for raising the ashes produced in the engine-room are also in contemplation.

The engineers of the railway were Sir James Brunlees and Sir Douglas Fox.

The remainder of the article is devoted to a table of weights, and discussions of the dimensions, strains, etc.

FALL OF A WATER-TOWER AT KANKAKEE, ILL.

DURING a gale of wind, on October 14 the water-tower at Kankakee was overturned. The wind began blowing very strongly in the early morning, and reached an estimated velocity of sixty miles an hour. By 9 A. M. the tower was observed to be swaying slightly; the vibrations increased until the successive wind-gusts raised it on one side or the other several inches at the foundation. An unsuccessful attempt was made to arrest this movement by tightening the nuts on the anchor-rods, but the tower soon fell.

We quote the following particulars from the *Kankakee Gazette*:

"As the gale grew stronger the tower with each vibration lifted itself further from its bed. Meantime, the top of the tower inflated and contracted like the sides of a panting horse. Then the windward side collapsed, forming a pocket extending downward from the top twenty-five or thirty feet, and the fall of the tower soon followed in a direction from the wind.

"The tower was 124 feet high and 20 feet in diameter. It was constructed of plates of ¾-inch boiler iron, four feet wide and ten feet long, diminishing in thickness to No. 9 iron (one-eighth of an inch thick) at the top. It was intended to have iron rods across the top to act as braces and prevent a collapse. These were put on, it is said, but taken off for some reason. The tower was erected by the Sharon Boiler-Works, of Sharon, Pa., under the direction of William Jones. The foundation was of solid stone and concrete, seven feet deep, about twenty-one feet in diameter, and rose about eight inches above the surface of the ground except on the side toward which the tower fell, where an excavation left the wall exposed for about a yard. Mr. Shannon, Superintendent of the Water-Works Company, computed the resisting or supporting capacity of the foundation at 160,000,000 pounds, while the tower when filled with water would have weighed only 22,000,000 pounds. Six anchor-rods, two inches in diameter, extended from about six feet above the foundation into the foundation a distance of two feet, where they turned at right angles and ran laterally into the stone about two feet. One-third of the foundation, on the side toward which the tower fell, is broken down and sloughed off to a depth of three feet. Whether this crumbling began before the fall of the tower or was caused by the weight of the tower as it leaned far over we cannot say. On the windward side the rods were broken off."

ENGINEERS' CLUB OF PHILADELPHIA.

At a recent meeting the secretary presented for Mr. John Graham, Jr., an illustrated description of the horizontal turbines at Willimantic. The objects of the horizontal arrangement were to avoid complication of gearing and loss by friction from weight and pressure on step, and to attain greater power from available head of water. Two

sets of turbines, each operating two pumps, are placed upon connected horizontal shafts, revolving in cast-iron casings, to which the water is admitted through the iron inlets six feet in diameter.

The special features of this turbine arrangement are as follows: Two movable or revolving wheels—the blades of which are bronze—forty-four inches in diameter, are secured to a horizontal shaft placed nine feet above the tail water or lower level. They are made to turn to the right and left, but placed in such a manner in relation to each other as to cause the shaft to revolve by the action of both turbines. The mechanical arrangement is such as to admit, by simply removing six coupling bolts, of operating the pumping machinery with one turbine.

In this case the end thrust caused by the want of counter action of the second turbine is taken up by glass disks surrounded with oil.

Another feature is the mode adopted for controlling the action of the water by means of sliding gates placed in front of the guide-wheels.

Looking over records of Jonval turbines constructed, with the exception of "Geyelin's Duplex Jonval Turbines," it will be found that the gates heretofore used were placed below the turbines, very often at the outlet of the draught-tubes, requiring, for proper construction, a foundation-plate resting upon a planked floor.

The advantages claimed for these sliding gates, controlling the inlet of the water instead of the outlet, are:

First—The greater simplicity of the construction of the wheel-pit, requiring no planked floor—often very expensive to place, owing to the presence of water.

Second—A more economical action of the water when contraction becomes necessary in the flow through the turbine, caused by either want of water or want of sufficient resistance in the machinery to be propelled.

Third—Greater simplicity in construction—consequently, greater reduction of cost.

The speed of the turbine shaft, when operated under nineteen feet fall, is 105 revolutions per minute.

The motion of the turbine can, by the shifting of a pinion, be transmitted to either set of pumps.

The general arrangement of the Willimantic plant was given by Mr. J. T. Fanning, H. E., and constructed and put in operation by the Camden Iron-Works, from plans furnished by Mr. E. Geyelin, whose work is so well known in this country.

THE AMERICAN SOCIETY OF CIVIL ENGINEERS.

At the semi-monthly meeting of the American Society of Civil Engineers, held at their rooms on the evening of the 20th inst., the first paper read was a brief description of "a clamp for pulling sheet-piling," by Mr. Charles E. Emery, M. Am. Soc. C. E. This differs from the ordinary rectangular link or clamp which slips over the plank, in having one end of the link cut open so that it can be slipped on the edge of the plank instead of over the top, thus obviating the necessity of pushing each plank in succession sideways to make a space for the closed end of the link. Of course, the clamp has to be made much heavier to resist the increased strain thrown upon the remaining parts.

The second paper was by the same gentleman, "On a Novel Application of the Polar Planimeter." This described a very ingenious application of a special form of planimeter invented by the author for the purpose of integrating the records of the metres used for measuring the steam furnished consumers by the New York Steam-Heating Company. The steam is sold by the thousand "kals," a kal being 1,000 pounds of water raised from a temperature of a 100° Fah. temperature, and delivered in steam of 70 pounds pressure, and the interesting statement was made that it was sold at less than would pay for carting the same amount of water over the same distance.

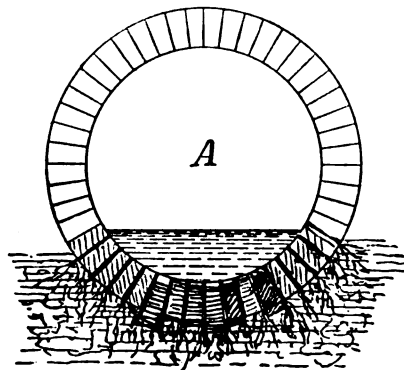
It was also stated that the loss of pressure in the pipes did not exceed about two pounds at the extreme points now reached (about five-eighths of a mile).

An interesting exhibit of sands thrown out of the fissures at "Ten-mile-hill," near Charleston, by the earthquake, of fragments of bricks with mortar attached, etc., was made, and a letter read from Mr. H. A. Duc, Jr., of that city. The chief additional points of interest were, that buildings on high ground were more damaged than those on low ground, and that location seemed to have more to do with the damage done than the character of the mortar and masonry or of the foundations, although in like situations the best work withstood the shocks best.

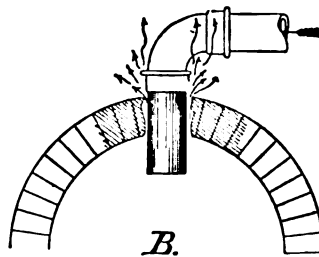


DRAINAGE SYSTEM OF THE TREASURY BUILDING, WASHINGTON.

SUPPLEMENTING the account of the condition of the plumbing in Secretary Manning's private office, published in our issue of September 30, we illustrate here from a sketch sent us by Inspector Samuel A. Robinson a section of sewer and connection, the condition of which he thus describes:



A SECTION OF SEWER IN TREASURY BUILDING, WASHINGTON, D. C. AND METHOD OF MAKING CONNECTIONS.



"A is a section of 24-inch brick drain under the basement of east front of the U. S. Treasury Department. This sewer has been in the building, I suppose, about forty years, and when examined by me in person was found to be in the condition shown by the drawing. The sewage matter is leaking through the bottom all along the whole line of sewer and polluting the ground under this part of the building. The crown of this drain is also defective, it requiring only one blow of the hammer to crush it in. It is built of only one thickness of brick, and apparently put together with mortar instead of cement.

"There are about 1,500 feet of brick drains inside of the building ranging in size from eighteen to thirty-six inches, so we can form an opinion, without an analysis, of the condition of the atmosphere.

"B is a 4-inch exhaust-pipe found emptying into the sewer with the cut made in the crown of the arch and left open as shown on drawing.

"This sewer receives the drainage from fifty-seven water-closets, fourteen wash-basins, fourteen urinals, and two rain-water leaders, which suggests the quality of the material with which the ground is being polluted."

CHICAGO MASTER PLUMBERS' ASSOCIATION.

(From our Special Correspondent.)

THE association met October 20, about thirty members present, including President T. C. Boyd; also, Mr. Alexander W. Murray, long detained from the meetings. Chairman Daniel Rock, of the License Committee, reported the giving of various indorsements of applications for plumbers' licenses. Chairman J. J. Hamblin, of the Apprenticeship Committee, urged all masters to send in the names of their apprentices to Secretary Whiteford, of the committee. On recommendation of the Executive Committee J. H. Lockett was marked for expulsion for insubordination unless he should give satisfactory explanations in ten days. The date of the annual meeting and election of officers was changed from June 1 to January 1.

It was resolved that the Baltimore Resolutions be adhered to. "I thought," said Patrick Nacey, "that our last national convention modified all that and that those resolutions are a dead letter." "No, sir," said President Boyd, "you'll find that when they get after you and your traps it is not a dead letter." Jack Hamblin added: "The modification you talk of was to let New York down easy, but not Chicago. Our constitution on that point remains as stiff as ever." It was declared that all journeymen and apprentices should, on applying for new work, present recommendations from their former employers. Charley Wallace and Johnnie Blake ("Paddy Blake's brother, and in the business in Chicago for thirty years,") applied for membership, paying each \$10. William Wilson resigned from the Arbitration Committee, but the matter was referred to the Executive Committee.

NEW YORK PLUMBERS' STRIKE.

If the New York Journeymen Plumbers' Association is organized and maintained to promote the best interests of its members, its leaders and members should realize by this time that money enough has been lost, inconvenience enough endured, and distress enough suffered by the families of the men to demand the discontinuance of a strike that never should have been ordered, and, when begun, should have been abandoned as soon as it was made manifest that, however desirable to secure the better training of plumbers, this latest move with that alleged object in view was started on the wrong road. Such being the case, the only sensible thing to do is to stop and turn back. This conclusion is an irresistible one if we are to assume that the union is intended to benefit its members and not be a machine for the persecution and worry of employers and irritation of property owners.

Some weeks ago THE SANITARY ENGINEER printed the journeymen's story of their side of the controversy as was just and proper. But that circumstance does not justify the inference that THE SANITARY ENGINEER thinks that the union's demands were right or expedient. In the form in which they are, and have been, before the public they are certainly wrong, as is evident to any one reading the following clauses of their card, which are the principal points of contention, and the subsequent explanation that they do not mean what they say is of no avail so long as the strike continues. These sections, which are either wrong in principle or impracticable, read:

"That but one apprentice shall be allowed to every four journeymen or fraction thereof.

"That this association shall have a voice in the selection of all apprentices.

"That each apprentice shall be obliged to pass an examination under a board of directors appointed by this organization for that purpose, and be compelled to register, and report to the same quarterly.

"That all apprentices be legally indentured.

"No member of this organization will permit any helper or assistant to use his tools, or any tools that said helper or assistant may provide, or be provided with by his employer or other person, except that said helper or assistant be legally indentured as an apprentice according to the apprentice laws of the State of New York. Any member violating this law shall for the first offence be fined ten dollars, for the second offence twenty-five dollars, the third offence fifty dollars, and for the fourth offence expulsion."

The last seven weeks have demonstrated to the several hundred plumbers who have been working and been compelled to pay one day's wages per week toward the support of men on strike, that in most plumbing-work a helper is needed.

That, however, is not a matter for discussion at this time. To make a mistake is not a sin, to persist in it to the injury of innocent people after it has been made manifest certainly is; and though it requires more pluck to acknowledge an error than to stick to it, the exercise of that very courage is what is now wanted of the majority of the members of the Journeymen's Union. This strike should end with this week. The Masters' Association, we believe, will show no resentment, though severe losses have been inflicted on master plumbers, who have been good workmen and considerate employers—men indeed who deserve better treatment than they have been compelled to receive at the hands of the Journeymen's Union, and who, by the sacrifices they have made in this contest, deserve the indulgence and consideration of every property owner and good workman. This should no longer continue. The journeymen, whatever their intentions were, made the mistake this time, and they should admit it, and go to work without further delay.

CONTRACTING INTELLIGENCE SUPPLEMENT

OF

THE SANITARY ENGINEER,

DEVOTED TO

ENGINEERING, ARCHITECTURE, CONSTRUCTION, & SANITATION.

A JOURNAL FOR THE ARCHITECT, ENGINEER, MECHANIC, AND MUNICIPAL OFFICER.

VOLUME 14.]

NEW YORK, OCTOBER 30, 1886.

[NUMBER 22



For works for which proposals are requested, see also the "Proposal Column," pages 514 and 525.

CONSTRUCTION.

WELL-BORING.—St. Louis, Mo., capitalists have formed a company to bore gas-wells in the vicinity of that city. Prof. Isaac S. Wise, of the State University of West Virginia, has reported to them in favor of the project.

ALLEGHENY, PA.—Mr. Armstrong, Superintendent of the Water-Works, wishes to secure a method of filtration. The capacity of the filters must be large.

WEST RANDOLPH, VT., proposes to expend \$20,000 on its water-supply.

ROCHESTER, MINN.—The water company has completed arrangements for sinking a well and erecting a pump-house in East Rochester.

WASHINGTON, D. C.—Bids for tearing down buildings on the site of the proposed Congressional Library building were received October 20. As soon as the work of demolition is completed work will begin on the foundation of the new structure. The office of the Library Commissioners is at 145 East Capitol Street.

HAMILTON, ONT.—Proposals will be advertised for pumping and boiler houses at Burlington Beach. Plans have been prepared by W. A. Edwards, architect.

KANSAS CITY.—The *Times*, under date of October 22, reports that the \$500,000 capital stock of the American National Bank Building of that city has been subscribed, and an Eastern architect is in the city to make a survey and prepare plans. The building will stand on the corner of Eighth and Delaware Streets.

ATLANTA, GEO.—It has been decided that buildings to cost \$93,000 shall be built here for the Technological School. Mayor Hillyer, of Atlanta, will give further information. Plans, it is understood, have been prepared.

HALIFAX, N. S., CITY HALL.—The city authorities some time since decided that a new city hall should be built, and invited competitive plans from architects. These were opened on October 4, and that of Mr. Edward Elliot has been selected. It provides for a building to cost about \$75,000, materials brick, free-stone, and granite. For further information address Alderman Stephen, Chairman of the Halifax Board of Works.

LACONIA, N. H.—A sewerage plan will be adopted. Dr. Irving A. Watson, of Concord, Secretary of the New Hampshire State Board of Health, and Col. George E. Waring, Jr., of Newport, R. I., have made a preliminary inspection, and Col. Waring has been directed by the town to complete the survey.

CORPUS CHRISTI, TEX.—Address the San Antonio and Arkansas Pass Railway in regard to an extensive building project on Padre Island, involving iron pier and bridge construction, buildings, and way.

CLEVELAND, O.—Address President Stone, of the Park Commission, about the proposed park and reserve reservoir on the West Side.

GAS-WELL.—E. L. Barton, of Barton & Ackerman, of Reading, Pa., will sink a well near Remington, Pa.

BALTIMORE, MD.—The Cremation Cemetery Company has secured a site on which to build a crematorium similar to that at Buffalo, N. Y.

PUMPING-ENGINE.—The Board of Finance of Jersey City, N. J., has before it a request of the Board of Public Works for an appropriation for a new high-service pumping-engine. The board desires to purchase a Worthington engine, cost about \$28,000.

READING, PA.—The *Dispatch* says that the West Reading Water Company will make an effort in the near future to obtain a water-supply from Angelica Creek.

NEW BRIDGE.—The Commissioners of Chester County, Pa., having decided to have a bridge built over the Schuylkill near Royersford, Civil Engineer Bertollette has prepared the plans. Address the County Commissioners at West Chester, the county seat.

LITTLE ROCK, ARK.—Bids for building Pulaski County Court House were opened as follows, October 10: Harding & Bailey, \$68,975; Noah Hamlet \$71,400; Pettifer Bros., \$69,674; C. J. Fisher, \$77,150; all of Little Rock, Ark., and J. M. Brown, of Hot Springs, to whom the contract was awarded. The architect is Max Orlopp, of Little Rock.

MILWAUKEE, WIS.—The new water-tower in the Tenth Ward will now be constructed after the original plans, the Board of Public Works having received additional bids that will bring the entire cost within the appropriation. J. H. M. Govern will erect the tower proper for \$19,490, and F. Weinhagen will put in an iron stairway for \$2,584, both contracts to be formally let October 20. Mr. Govern's bid was \$8,000 less than the lowest bid received before, while the highest was \$10,000 above his own.

Frank Drew will construct pipe sewers for the city as follows: pipe-sewer in Lloyd Street, from Seventh to Eighth Streets, at \$1.65 per foot; Tenth Street, from North to Garfield Avenues, at \$1.70 per foot; Eleventh Street, from North to Garfield Avenues, at \$1.70 per foot; contract let October 23, 1886.

WASHINGTON, D. C.—Bids were recently opened by the Commissioners of the District of Columbia for the improvement of the extension of Massachusetts Avenue, 2,600 feet. The estimated quantities were: 59,800 cubic yards of earth excavation, 500 cubic yards of rock excavation, and 200 cubic yards of excavation for culverts. All the bidders were Washington parties. The prices ranged for excavation from 16½ cents per yard to 23 cents; for rock excavation, from 50 cents to \$2.50; for excavation for culverts, from 21 cents to \$1.20; for concrete masonry, from \$6 to \$9.50; for brick masonry from \$5 to \$12; for 12-inch pipe, from 12 cents to 90 cents, and for trap paving, from 75 cents to \$1.50.

DUBUQUE, IOWA.—Contractor Horace E. Horton is constructing a bridge, which is to cost about \$125,000, across the Mississippi River at this point. It will probably be completed next June.

NEWPORT, R. I.—The following were the bids for building retaining-wall for wharf at the end of the main sewer at foot of Marsh Street: William Beattie, of Fall River, \$6.75 per cubic yard for the entire work; C. T. Deery & Co., of Boston, \$9.48 for first section and

\$5.32 for second; John Beattie, of Leete's Island, Conn., \$14.75 and \$15; C. H. Edwards, Quincy, Mass., \$7 and \$4. The contract was not awarded as Mr. Beattie's bid, although the lowest, was a little above the estimates.

CARLYLE, ILL.—The following bids for 43 hydrants and 3½ miles of pipe were received by the City Council October 22: George C. Morgan, Chicago, Ill., \$48.83 per hydrant, total \$23.65 per annum, subsequent hydrants \$45; American Water-Works and Guarantee Co., McKeesport, Pa., \$58 per hydrant, total \$24.94 per annum, subsequent hydrants \$45; Water, Light and Power Co., St. Louis, Mo., \$48.83 per hydrant, total \$2,100 per annum for twenty-one years, subsequent hydrants \$45. The bid of the Water, Light and Power Co. being the lowest was accepted, and council adjourned to meet again on the 28th inst. to pass final ordinance and enter into contract.

MESSRS. M. C. FORSTER & SON, of Waterville, Me., have been awarded the contract for building a shoe factory at Portsmouth, N. H., to cost \$16,500.

PHILADELPHIA.—Contracts for building the Somerset Street bridge at Philadelphia and the Ontario Street bridge over the Germantown branch have been awarded to Michael O'Rourke for \$22,000 and \$12,000.

WHATELY, MASS.—Bartlett Bros. have just secured the contract for building the Dedham Library at \$25,000.

ST. PAUL, MINN.—The Waterous Engine Company are building their new works at South Park, near the stock-yards. The main building is 50x100, two stories, of brick, to cost \$6,500. H. R. Hamilton, architect.

THE North Side Gas Company, of Allegheny County, Pa., has been organized. Calvin Wells, of the *Philadelphia Press*, is a large stockholder.

COVINGTON, KY.—The Elizabethtown and Big Sandy Railroad will be built through the Sixth Ward of Covington as soon as City Council passes the necessary ordinance.

PARKERSBURG, W. VA.—Address Chief Engineer James Fickinger, of the Ohio River Railroad, in reference to extension to Huntington. Office is in Parkersburg.

LEHIGH VALLEY RAILROAD.—The company is laying out a tract of 350 acres in Buffalo, N. Y., in canals and docks. Three of the six canals are already built. There will also be freight-houses and other buildings. The total improvement will cost \$500,000. Address Col. J. E. McIntyre.

STREET RAILWAY.—The Ithaca Street-Car Company will build a line of road. Address Hon. H. W. Sage, at Ithaca.

CHATTANOOGA, TENN.—The Mountain Spring Water Company has passed into the control of Philadelphia capitalists, and they will push the works rapidly. It is said they will build a large reservoir and erect powerful pumping-engines.

RAILROAD EXTENSION.—It is proposed to extend the Mount Vernon, Coshocton & Wheeling Railroad to Wheeling, W. Va. Archibald Fairlie is in Wheeling to consider the matter in the interest of English capitalists.

NEW RAILROAD.—The Philadelphia Midlands Railroad, from Philadelphia to West Chester, already surveyed, is to be soon put in operation. The road is owned by men in the management of the Pennsylvania Railroad.

IMPROVEMENTS OF ROAD.—The Lehigh Valley Railroad is about to make extensive building alterations and do trestle-work. The trestle will be built by Col. J. F. McIntyre, of Buffalo. The cost of improvements is \$75,000.

CINCINNATI, O.—The Cincinnati, Hamilton & Dayton Railroad is proposing to build an elevated road. The President is Melville E. Inglis.

GOVERNMENT WORK.

WASHINGTON, D. C.—No bids were received for carpentry and miscellaneous work on Public Building at Concord, N. H. The Supervising Architect will accordingly be compelled to readvertise.

TOLEDO, O.—Synopsis of bids for steam-heating Custom House opened October 20: John Lyon, \$14,416; Shaw, Kendall & Co., \$13,500; Bates & Johnson, \$15,000; Baker, Smith & Co., \$13,880; Walworth Manufacturing Co., \$17,844; Exhaust Ventilator Co., \$13,421; West Point Engine and Machine Co., \$14,165; Samuel I. Pope & Co., \$12,897; Pierce, Butler & Pierce, \$12,473; William Kirkup & Son, \$11,280.

CONCORD, N. H.—Synopsis of bids for carpentry for Post-Office, etc., opened October 18: Mead, Mason & Co., \$11,000; Peter W. Webster & Co., \$11,600; E. B. Hutchinson, \$12,200.

BALTIMORE, MD.—Synopsis of bids for furring and lathing Post-Office, etc., opened October 20: Haugh, Ketcham & Co., \$4,884.30; John Cooper, \$4,828; Hoyt & Romant, \$5,858.32.

ERIE, PA.—Synopsis of bids for iron roofs, etc., for Court House, etc., opened October 18: Pennsylvania Construction Company, Pittsburgh, Pa., \$14,200; Haugh, Ketcham & Co. Iron-Works, Indianapolis, Ind., \$9,460.06; The Variety Iron-Works Co., Cleveland O., \$11,683; Wallis Iron-Works, Jersey City, N. J., \$11,879; Motherwell Iron and Steel Co., Logan, O., \$14,095; Snead & Co. Iron-Works, Louisville, Ky., \$10,225. Department's estimate, \$11,493.

MACON, GEO.—Synopsis of bids for masonry for Court House, etc., opened October 23: John Moore, Syracuse, N. Y., \$67,300; McCarthy & Corbett Washington, D. C., \$58,618; Terre Haute Stone-Works Co., Terre Haute, Ind., \$56,000; Leamy Bros. & Crawford, Syracuse, N. Y., \$64,500; The Belknap & Dumesneil Stone Co., Louisville, Ky., \$45,700; Dumesneil & Bro., \$45,000; Oman & Stewart Stone Co., Nashville, Tenn., \$50,800; L. D. Willcutt, Boston, Mass., \$58,639.

BALTIMORE, MD.—Synopsis of bids for plastering Post-Office, etc., opened October 20: D. W. Lloyd, \$28,000; Smith & Crimp, \$18,973; Hugh & Thomas Melon, \$22,250; Joseph Eastman, \$22,222; G. W. Starr & Sons, \$74,240; James W. Child, \$48,950; Frank W. Garretson, \$28,473; James Kennedy, \$37,531.53; Robert M. Chambers, \$23,610.40; Charles W. Magull (informal), \$31,500.

ROCK ISLAND, ILL.—The following bids for furnishing stone for Des Moines Rapids canal and dry dock were received by Major A. MacKenzie, U. S. Engineer Office, October 19, 1886: Patterson Bros., Keokuk, Ia., 1,000 cubic yards face stone, \$10 per yard; 1,000 cubic yards backing stone, \$6 per yard; 2,000 cubic yards rip-rap face stone, \$2.25 per yard; 1,000 cubic yards rubble filling, 70c. per yard; total, \$21,200.

CINCINNATI, O.—The following bids for filling and paving the land lock wall inclosure at Davis Island dam, Ohio River, were received by Lieut. Lansing H. Beach, Corps of Engineers, and opened October 19, 1886:

BIDDERS.	Earth Filling, 8,000 cu. yds. Per cu. yd.	Cinder Filling, 8,000 cu. yds. Per cu. yd.	Paving 254 squares. Per square.	Aggregate with Earth Filling.	Aggregate with Cinder Filling.
F. Ginner, Allegheny City, Pa.	\$0.50	\$0.40	\$1.00	\$9.00	\$9.00
Harold & McDonald, Pittsburgh, Pa.	79	60	11.50	9.18	9.18
James S. Routh, Pittsburgh, Pa.	79	60	11.50	9.18	9.18
Water and Gas Works Construction Co., Pittsburgh, Pa.	79	60	11.50	9.18	9.18
Martin Dougherty, Pittsburgh, Pa.	79	60	11.50	9.18	9.18
John J. Shipman & Co., Newport, Ky.	79	60	11.50	9.18	9.18
Watson & Sprout, Allegheny City, Pa.	79	60	11.50	9.18	9.18
L. V. Hoag, Jr., Pittsburgh, Pa.	79	60	11.50	9.18	9.18
John F. King, Belpre, O.	79	60	11.50	9.18	9.18
Booth & Finn, Pittsburgh, Pa.	79	60	11.50	9.18	9.18

ABSTRACT of proposals for dredging across North River Bar, N. C., opened by Captain F. A. Hinman, Corps of Engineers, U. S. A. immediately after noon of October 22, 1886: George E. Ward, Washington, D. C., 14 1/2 c., per cubic yard; James Caler & Son, Norfolk, Va., 13 1/2 c.; Thomas P. Morgan, Washington, 23c.

WASHINGTON, D. C.—Bids for dredging and for rip-rap stone on the Potomac River improvement were opened by Lieut.-Col. Peter C. Hains, Corps of Engineers, U. S. A., October 26, as below:

Dredging in the Tidal Reservoir—Bunson & McNee, 15c. per cubic yard; Ross & Sanford, Jersey City, 21c.; American Dredging Co., Philadelphia, 20c.; Rittenhouse Moore, Mobile, Ala., 18 1/2 c.; W. H. W. Morris, New York, 20c.; Morris & Cummings Dredging Company, 19 1/2 c.; amount of material about 500,000 yards.

Dredging and embankment, Sec. III.—George C. Fobes & Co., Baltimore, Md., 13c. per cubic yard; Rittenhouse Moore, Mobile, Ala., 15c.; Ross & Sanford, Jersey City, N. J., 13c.; W. H. W. Morris, New York, N. Y., 11 1/2 c.; American Dredging Co., Philadelphia, Pa., 12 1/2 c.; Thomas P. Morgan, Washington, D. C., 14c.; Henry Wilson, Washington, D. C., 10c.; Morris & Cummings Dredging Co., New York, N. Y., 12c.; Frank C. Somers, Philadelphia, Pa., 11c.; amount of material about 200,000 cubic yards.

Dredging in the Washington Channel—Bunson & McNee, 11 1/2 c. per cubic yard; George C. Fobes & Co., Baltimore, 24c.; Ross & Sanford, Jersey City, 20c.; W. H. W. Morris, Mobile, Ala., 21c.; Rittenhouse Moore, Mobile, Ala., 18 1/2 c.; American Dredging Co., Philadelphia, 20c.; Morris & Cummings Dredging Co., New York, 20c.; amount of material about 400,000 cubic yards.

Rip-rap stone—G. Vanderwerken, Washington, delivered at Sec. III., 20,000 yards at \$1.08; delivered at outlet gate, 12,000 yards at 93c.; H. P. Gilbert, Washington, 20,000 yards at \$1; 12,000 yards at \$1.

Awards of contracts were not made at time of going to press.

HAMPTON, VA.—Proposals for four horizontal tubular steam-boilers, 54 inches in diameter, and 14 feet long, were opened by Mr. W. C. Gunnell, C. E., for the National Home for Disabled Volunteer Soldiers, October 26, as follows: E. J. Codd & Co., Baltimore, \$3,815; Crook, Horner & Co., Baltimore, \$3,400; Bartlett, Hayward & Co., Baltimore, \$790 each, total \$3,160; Henry Warden, Philadelphia, \$1,275 each, total \$5,100. The contract is awarded to the lowest bidders, Bartlett, Hayward & Co.

WASHINGTON, D. C.—In the matter of bids for heating-apparatus for fourth floor of New Pension Building (THE SANITARY ENGINEER

Supplement, October 23), the award has been made to the Walworth Manufacturing Company for 38 Walworth radiators, with self-acting air-valves, delivered at the building ready to be set up, \$793; and to William Rothwell, for pipes, valves, and other materials and work of setting up, \$535, less for the air-escape valves which are included in the bid of the Walworth Manufacturing Co., \$28.50, total \$506.50.

CINCINNATI, O.—The following bids for crib extension at Davis Island Dam, Ohio River, were received by Lieut. Lansing H. Beach, Corps of Engineers, and opened October 16, 1886:

BIDDERS.	Soft Timber. Per M.	Oak. Per M.	Stone. Per ton.	Masonry. Per cu. yd.	Excavation. Per cu. yd.	Drift Bolts. Per lb.	Screw Bolts. Per lb.	Aggregate.
James S. Routh, Pittsburgh, Pa.	\$20	\$30	\$75	\$4.00	\$0.50	\$0.04	\$0.04 1/2	\$7.485
J. I. Shipman & Co., Newport, Ky.	19	19	1 24	4 50	40	04	06 1/2	3 025
Water and Gas Works Construction Co., Pittsburgh, Pa.	18	25	1 45	3 75	49	04 1/2	10	3 345
John F. King, Belpre, O.	30	24	1 33	5 00	50	04 1/2	10	3 350
L. V. Hoag, Jr., Pittsburgh, Pa.	30	30	1 65	5 00	40	05	10	3 430
Harold & McDonald, Pittsburgh, Pa.	22	33	2 45	4 50	20	06	10	5 514
Booth & Finn, Pittsburgh, Pa.	35	40	3 00	7 00	10	08	14	5 806

EASTPORT, ME.—It is likely that the demands of the insurance companies for a water system and improvement in the manner of construction will result in the building of a suitable water-works for this place.

AT the annual meeting of the Buffalo Society of Architects, October 20, the following officers were elected: President, C. K. Porter; First Vice-President, George K. Metzger; Second Vice-President, Louise Bethune; Secretary, W. W. Carlin; Treasurer, R. A. Bethune.

WILMINGTON, DEL.—Address Chief Engineer or Commissioner Porter, Chairman of the Board of Water Commissioners, on measures to be taken to prevent further sewage pollution of the Brandywine.

YORK, ME.—John C. Stewart asks for proposals, until November 1, for constructing a 2-foot gauge railroad about eight miles long, for the York Harbor and Beach Railroad Company. Specifications at the Engineer's office in York.

RECENTLY incorporated is the Lake Mahopoc and Connecticut Railway Company to operate a railroad from East Fishkill to the New York and Harlem Railroad, distance thirty miles. Among the directors are Peter Bowe and Henry B. Lounsbury, of Brooklyn, and O. D. M. Baker, of Poughkeepsie.

THE East Coast Railway and Steamship Company of Florida has been incorporated to build a railway from Titusville, Brevard County, to Turtle Harbor, Monroe County, 285 miles.

A WATER company has been organized at Fort Fairfield, Aroostook County, Me.

NEW RAILROAD.—A road will be built from Aron, Ala., to the Sheffield and Alabama Railroad. Address Robert Jemison or James E. Webb, at Birmingham, Ala.

Building Intelligence.

We solicit from each and every one of our readers information relating to projected buildings in their locality, and should be glad to receive newspaper clippings and other items of interest.

ABBREVIATIONS.—b s, brown stone; br, brick; br st, brick store; b s dwll, brown-stone dwelling; apart house, apartment-house; ten, tenement; e, each; o, owner; a, architect; b, builder; fr, frame.

NEW YORK CITY.

510 W 48th, 5-story br ten with stores; cost, \$16,000; o, John Ensner, 727 10th av; a and b, Joseph Wolf.

3d av, s e cor 125th st, 5-story br store; cost, \$130,000; o, Louis Ranger, 17 W 56th st; a, Schwarzmann & Buchman.

62d st, n s, 155 w 2d av, 2-story br church; cost, \$20,000; o, Church Extension Committee of the Presbytery of New York, William L. Skidmore, Treasurer; a, S. A. Warner; m, J. W. Hogencamp & Son.

110th st, n s, 75 e Madison av, 2 5-story br tens with stores; cost, each, \$13,000; o, John Hickey and Hugh Brady; a, J. H. Valentine; b, Hickey & Brady.

10th av, n e cor 102d st, 2 5-story br tens with stores; cost, each, \$15,000; o, Max Rodding, 1658 1st av; a, George Matthias & Co.

76th st, s s, 200 e 10th av, 64-story and bmt br dwells; cost, each, \$25,000; o, Justus J. Smith, 1113 9th av; a, De Meuron & Smith; a and b, Smith & Drake.

10th av, s e cor 60th st, 3-story br (granite front in bmt) lecture bldg, "The Vanderbilt Clinic," cost, \$130,000; o, College of Physicians and Surgeons; a, W. Wheeler Smith; b, John J. Tucker and A. C. Hoe & Co.

152d st, n s, 425 w 10th av, 5-story br (s front first story and bmt) flat; cost, \$19,000; o, Christian Trinks, 450 W 50th st; a, M. L. Ungrich; b, by day's work.

125th st, n s, 120 w 5th av, 5-story br, s and iron front bldg; cost, about \$75,000; o, Young Men's Christian Association, W. W. Hoppin, Jr., President, 56 W 52d st; a, B. L. Gilbert; b, Charles A. Cowen and Erastus A. Smith.

238 126th st, 5-story br ten; cost, \$16,000; o, Mary M. Williams; b, O. A. Stowe.

8th av, s w cor 137th st, 5-story br flat with store; cost, \$25,700; o, Whitfield Terriberry, 24 Charles st; a, John C. Burne; b, not selected.

8th av, w s, 25 s 137th st, 3 5-story br flats with stores; cost, each, \$18,000; o and a, same as last.

Edgecombe av, w s, 90 s 145th st, 3 3-story br dwells; cost, each, \$10,000; o, a, and b, same as last.

145th st, s s, 175 w St. Anns av, 4-story br ten; cost, \$12,000; o, Albert C. Leroy, 136 2d st; a, Adam Munch.

170th st, n s, bet 3d and Fulton avs, 3-story br and cellar refrigerator bldg; cost, \$16,000; o, Henry Zeltner, 170th st and Fulton av; a, Adolph Pfeiffer; b, not selected.

293 Willis av, 4-story br ten with stores; cost, \$12,000; o, James Rothschild, 269 1 3d av; a, H. S. Baker.

2-4 Ferry st, and 84-86 Gold st, br store; cost, \$6,500; o, L. A. Robertson; a, John G. Porter.

305 W 14th st, br flat; cost, \$7,500; o, John C. Winch.

326-330 W 39th st, br storage bldg; cost, \$7,000; o, A. Finck & Son.

7th av, n w cor 58th st, br stable, riding academy; cost, \$5,500; o, Michael Duffy; a, C. A. French & Co.

2-4 Ferry st, s e cor Gold st, internal and external alterations; cost, \$6,500; o, L. A. Robertson, Cliff st, cor Ferry st; a and b, J. G. Porter.

7th av, n w cor 58th st, openings in walls and new corrugated iron front on 58th st; cost, \$5,500; lessees, Emile & Dolhom, 922 7th av; a, C. A. French.

BROOKLYN.

Magnolia st, s s, 75.8 e Wyckoff av, 2-story br stable and loft; cost, \$5,000; o and b, Richard Meyerose, 1579 Myrtle av; a, H. Vollweiler.

Sackman av, w s, and Christopher av, e s, 200 s Union av, 8 2-story fr dwells; cost, each, \$2,200; o, S. C. Wilson, Baldwins, L. I.; a, F. Weber; b, Post & Walker and J. Reed.

Sackman av, w s, near Blake av, 4 2-story fr dwells; cost, each, \$2,200; o, Arthur Dinsmore; a and b, J. Dinsmore.

Sterling pl, n s, 207 e 6th av, 3-story b s ten; cost, \$6,000; o, a, and con., John Taaffe, 1136 Herkimer st; m'n, M. Reynolds.

7th av, w s, 21 n 11th st, 2 3-story b s store and dwells; cost, each, abt \$6,000; o and b, Louis Bonert, 10th st, nr 6th av; a, F. E. Lockwood.

7th av, n w cor 11th st, 3-story b s store and dwell; cost, abt \$7,000; o, etc., same as last.

Macon st, s s, 150 e Reid av, 4-story br ten; cost, \$8,000; o, B. H. Weeks, 99 South Portland av; a, A. Hill; b, Thos. Muller.

Saratoga av, s e cor Herkimer st, 3-story br store and dwell; cost, \$5,500; o, W. H. H. Robbins, 838 Quincy st; a, B. T. Robbins; b, E. K. Robbins and J. Remsen.

Herkimer st, s s, 20 e Saratoga av, 5 2-story and bmt dwells; cost, each, \$3,500; o, etc., same as last.

25th st, n s, 80 e 3d av, 2 3-story br tens; total cost, \$11,000; o, Mrs. R. Krombach, 3d av, 25th st; a, M. J. Morrill; b, M. Walters and J. Sorenson.

Hancock st, s s, 40 e Marcv av, 4 3-story terra-cotta and br dwells; total cost, \$50,000; o and a, Montrose W. Morris, 45 and 47 Exchange pl, New York; b, T. B. Rutan.

Classon av, w s, 126 s Park av; 3 4-story fr (br filled) tens; cost, each, \$5,000; o, Daniel W. Reeve, 185 Reid av, and Geo. L. Moore, 351 Wyckoff st; a, Thayer & Robinson.

Madison st, s s, 255 e Sumner av, 6 2 1/2-story and bmt b s dwells; cost, each, \$5,400; o, a, and b, Daniel B. Norris, 359 Clifton pl.

197-199 Broadway, n s, 80 e Roebing st, 2 4-story br tens; cost, each, \$10,000; o, Kring & Gissel, Bowery, cor 7th st; a, E. F. Gaylor; b, Geo. Lehrian & Son and Jenkins & Gillis.

172 Duffield st, begins 125 s Myrtle av and 64 w Duffield st, 3-story br stable; cost, \$6,000; o, Joseph Brown, 172 Duffield st; a, M. J. Morrill; b, C. Cameron and W. S. Wright.

Wythe av, s e cor North 10th st, 2 4-story br stores and dwells; total cost, \$14,000; o, Edward Duggan, South 4th st, cor 5th st; a, A. Herbert; b, Mead & Son and H. Ackerly.

7-9 McKibbin st, 3-story br stair builders' factory; cost, \$4,200; o, William Shindle & Bros., on premises; a, A. Herbert; b, Deering & Son.

Starr st, n s, 100 e Central av, 3 3-story fr (br filled) tens; cost, total, \$12,000; o, Maria A. Singer, Starr st; a, H. Vollweiler; b, J. Kling and J. Rueger.

Gates av, s s, 25 e Downing st, 2-story br bakery; cost, \$8,000; o, L. A. Robertson, 164 Gates av; a, E. Osborn.

Atlantic av, s w cor Madison st, 3 2-story fr stores and tens; total cost, \$6,000; o, A. H. Lowerre, 71 Orange st; a, S. B. Reed.

46th st, n s, 279 e 3d av, 3 2-story and bmt, frame dwells; cost each, \$2,400; o and b, William Hunt, 259 Carroll st; a, M. Freeman & Son.

11th st, s w s, 157.4 w 7th av, 2 3-story br flats; cost, each, \$4,500; o, Chas. Nickenig, 368 11th st.

23d st, s s, 250 e 4th av, 3-story frame (br filled) ten; cost, \$5,200; o, Frederick Zohra, 5th av; a and b, J. T. Perry & Son.

Varet st, n s, 100 e Humboldt st, 2 3-story frame (brick filled) tens; cost, each, \$3,400; o, Charles Engert, 182 Montrose av; a, F. J. Berlenbach, Jr.

Palmetto st, s s, 225 e Central av, 2 3-story fr (br filled) tens; cost, each, \$4,000; o, Catharine Hill, 57 Cedar st; a, P. W. Higginson; b, P. H. Hill.

4th av, w s, 56 s Baltic st, 2 3-story br flats; cost, each, \$3,000; o, E. A. Wooley 7th av, cor Carroll st; a, P. Dixon.

Magnolia st, s s, 75.8 e of Wyckoff av, br stable; cost, \$5,000; o, R. Meyerose; a, H. Vollweiler.

Sackman av, w s, and Christopher av, 200 s of Union av, E. N. Y., 8 dwells; cost, each, \$2,400; o, S. C. Wilson; a, F. Weber.

BUILDING INTELLIGENCE.

BROOKLYN—(Continued).

Suydam st, n s, 125 e Central av, 4 3-story fr (br filled) tens; cost, each, \$4,000; o, Wm. Schildknecht, Bushwick av, cor Greene av; a, Platte & Acker.

ALTERATIONS, NEW YORK.

305 W. 14th st, dwell altered to flat, bmt and light shaft built and 4-story br extension; cost, \$7,500; o, John C. Winch, 356 W. 23d st; a, Emile Gruwe.

Grand st, n e cor East st, factory altered to 3-story build and 3-story br exten; cost, \$10,000, lessee, C. G. Emery, firm of Goodwin & Co., on premises; a, G. P. Chappell; b, not selected.

78 2d av, attic raised to full story and 4-story br exten; cost, \$5,000; o, Mrs. Emilie Gebhard, 159 Ludlow st; a, Fred. Ebeling.

1310 5th av, parapet raised and rebuilt, also repairs; cost, \$6,000; o, O. D. Munn, 361 Broadway; a, C. T. Mott.

ALTERATIONS, BROOKLYN.

11 Tiffany pl, add one story, also 4-story br exten; cost, \$16,500; W. A. Walter, 65 Duane st, New York; a, M. Thomas; b, P. J. Carlin and W. S. Wright.

Walworth st, w s, 100 n Willoughby av, addn. 3 stories of brick; cost, \$3,550; o and a, Doty & McFarlan, Willoughby av, cor Walworth st; b, J. W. Campbell and Mills & Bush.

MISCELLANEOUS.

ATLANTIC CITY, VA.—Br church; cost, \$6,500; o, Baptist; a, George C. Moses; bids open Nov. 1.

ALLEGHENY, PA.—Page and Fulton sts, br school-house; cost, \$45,000; o, Fifth Ward; a, Joseph Anglin; b, Robert M. Cain.

Lacock and Vine sts, br store bldg; cost, \$9,000; o, Fred. Smith; a, John M. Alston; b, R. J. Graham.

ALBANY, N. Y.—The Dominican Convent building contracts have been let: mason-work to Frank J. Dunn, carpentry-work to E. A. Walsh. It will be located on Madison Avenue.

BALTIMORE, MD.—Lombard near Washington, 4 3-story br dwell; o, Schenelene & Shamberger.

Striker and Winchester, 10 br dwells; o, C. A. Pindell.

McKim and Preston, 4 br dwells; o, J. W. Sindall.

Valley and Chase, 2 br dwells; o, C. Sheehan.

BALTIMORE, MD.—In progress 61 dwells and several stores on Stricker, Whatcoat, and Tenant sts. Address Clarence A. Pindall.

BOSTON, MASS.—The year's work on the new public library is about completed, and work will soon be suspended until spring. The plans are all decided on, but there are some matters of detail in regard to the elevation which the trustees have still to settle. The building will have a length of 223 feet 8 inches, and a depth of 90 feet. The L, which is to contain the book-stacks, will be 84x74 feet in size. The building will be fire-proof. The book-stacks will be of iron. The material used in the construction of the building will be brick, with brown stone facings. The contract for the piling was given to Mr. George H. Cavanagh, and the work has been done under the superintendence of George T. Baker, Jr.

BUTLER, PA.—H. Disston & Sons, of Philadelphia, will erect steel-works, ten acres of land having been donated by the town.

CHICAGO, ILL.—12-14 S Canal, br warehouse; cost, \$10,000; o, A. J. Kirkwood; a, Burling & Whitehouse; b, L. Weick.

344-62 Dearborn, br warehouse; cost, \$33,000; o, Madlener & Lockner; a, E. Bauman; b, L. Weick.

1070-76 W 12th, br dwell and store; cost, \$21,000; o, John F. Ewing.

BUILDING INTELLIGENCE.

CHICAGO, ILL.—3429 Michigan av, br dwell; cost, \$10,000; o, H. M. Loomis; a, Schaub & Berlin.

1626-38 Lake, br store and flats; cost, \$20,000; o, T. J. Biden; a, J. C. Zarbell; b, M. Conley.

171-73 21st st, br flats; cost, \$10,000; o and b, J. F. Barney; a, C. H. Palmer.

456-58 Ogden av, br store and flats; cost, \$15,000; o, H. D. Mukalls; a, E. Snyder; b, O'Donnell & Ormsby.

824 Milwaukee, br store and flats; cost, \$10,000; o, A. Leon; b, C. Wagner.

406-10 Superior, br dwell; cost, \$15,000; o, W. F. Newberry; a, C. L. Stiles; b, C. H. Moses.

231 Lake, br store bldg; cost, \$11,000; o, J. N. Drummond; a, W. W. Boyington; b, C. H. Moses.

205-07 Centre av, br flats; cost, \$12,000; o, Jul. Meyer; a, H. Saxe; b, F. Dabelstein.

1127-77 W Superior, 11 br cottages; cost, \$27,500; o, T. M. Crowley and Samuel Kerr.

Tolwon and Rockwell sts, br cottages; cost, \$15,000; o, T. M. Crowley.

3132-42 Lake Park av, br dwells; cost, \$23,000; o, The Pullman Land Association; a, S. S. Beman; b, George Lehman & Sons Co.

3150-56 S Park av, br dwells; cost, \$21,000; o, E. Lederer.

Center and Orchard sts, br and s chapel and school bldg; cost, \$38,000; o, Fourth Presbyterian Church; a, T. W. Stickney, of Lowell, Mass.; b, George Lehman & Sons Co.

107-09 Lake Shore Drive, br dwell; cost, \$38,000; o, The Eddy House; a, Jenny & Otis; b, Mortimer & Tapper.

2559 Michigan av, br dwell and barn; cost, \$36,000; o, D. K. Hill; a, Burnham & Root; b, D. Lane.

594-96 Blue Island av, br store and flats; cost, \$14,000; a, J. N. Kralovec.

196-98 Ewing, br dwell; cost, \$10,000; o, R. Lebraico; a, W. L. Carroll.

56-57 Delaware pl, br dwell; cost, \$12,000; o, Naper Bros.

151-55 33d, 3 br dwells; cost, \$10,000; o, C. T. Gregory.

23-33 N. Lincoln, br dwell; cost, \$20,000; o, John Crane, Jr.

299-305 Michigan, elevator; cost, \$35,000; o, George Buller & Co.; a, Burling & Whitehouse; b, Rossler & Winkler.

225 Archer, br flats; cost, \$10,000; o, Mrs. M. Meyer.

3422 Prairie av, br dwell; cost, \$10,000; o, Mrs. A. F. Smith, a, William Strippelman; b, J. H. McCorphy.

3860 Lake av, br dwell; cost, \$13,000; o, Spoor Mackey; a, J. M. Wood; b, M. D. Price.

786-88 Fairfield, br flats; cost, \$10,000; o, John Benson.

Quarry, nr Cologne, 4-story factory; cost, \$10,000; o, O. D. Wetherill.

Woodlawn, nr Cottage Grove av, br dwell; cost, \$12,000; o, R. S. Critchell.

3635 Grand Boulevard, br dwell; cost, \$13,000; o, Dr. F. A. Wexham.

348-50 Ashland av, br flats, cost, \$15,000; o, Mrs. Redish; b, W. H. Cameron.

843-53 Walnut, br dwell; cost, \$18,000; o, W. S. Ellis; b, M. Johnson.

277-81 N May, br st and dwell; cost, \$10,500; o, E. Hogensen.

269-71 Leavitt, br dwell; cost, \$10,000; o, Mrs. N. G. Godman; a, J. T. Hall.

Michigan av, north of 37th, br dwell; cost, \$35,000; o, J. S. Carter; a, Charnley & Evans; b, not let.

Clark st, below Jackson, br and st dwell; cost, \$150,000; o, P. H. Heffron; a, Charnley & Evans; b, not let.

Western av and Harrison, br st and flats; cost, \$30,000; o, N. W. Good; a, W. G. Barfield; b, not let.

BUILDING INTELLIGENCE.

CHICAGO, ILL.—State, nr 33d st, br st and flat; cost, \$13,000; o, Mrs. C. M. G. Farsen; a, F. R. Schock.

Desplaines, nr Milwaukee av, br stable; cost, \$15,000; o, C. D. Gammon; a, F. R. Schock.

CHICOPEE, MASS.—Springfield st, fr bldg; cost, \$5,000; o, A. Jenks; a, Richmond & Seabury; b, Denis Murphy.

CINCINNATI, O.—Plum and 8th sts, Cathedral school house; cost, \$10,000; o, Cathedral; b, William Amber.

Plum and 7th sts, 3-story br bldg; cost, \$20,000; o, Thomas S. Burne; b, William Amber.

S e cor Liberty and Clay, 4-story br bldg; cost, \$13,000; o, Y. Heisel.

S w cor 4th and Vine, 6-story stone front bldg; cost, \$600,000; o, Chamber of Commerce; b, Pat. Murray.

Ohio av, nr Clifton av, 2-story fr bldg; cost, \$6,000; o, John W. Feldman.

N e cor Hunt and Montgomery, 3-story br bldg; cost, \$8,000; o, John G. Kochle.

Logan, n of Green, 3-story br bldg; cost, \$10,000; o, George Reif; b, John Sperry.

CINCINNATI, O.—For Proctor & Gamble's industrial village of Ivorydale, just out of Cincinnati, handsome office buildings are now being planned by S. S. Beman, of Chicago, the architect of the various other buildings comprising the "Ohio Pullman." Among those structures are: a large warehouse, four packing-houses, two kettle-houses, one crutchers' house, one boiler-house, one steaming-house, one lye-house, one machine-shop, one storage house, one blow-out house, one digester, and the foundations are in for the glycerine house, for the mold and finishing house, for the press room house and for the still house, and the contracts are being let to finish all these. The material to be used, as in the structures already completed, will be pressed brick and stone. It is proposed to build the Ivorydale office buildings of stone and slate, 58x80 feet, two stories and high attic. Messrs. Proctor & Gamble have under contemplation a church and cottages for the workmen; also, a town hall, with library, and various other buildings that must give an ideal completeness to their industrial village of Ivorydale.

CLEVELAND, O.—St. Clair and Wood, br and stone bldg; cost, \$30,000; o, W. J. Morgan & Co.; a, Cudell & Richardson.

Ontario, br and stone bldg; cost, \$20,000; o, Ralph Worthington; a, Cudell & Richardson; b, H. G. Stalmeyer.

Bank and Lake, br and terra-cotta bldg; cost, \$90,000; o, Bradley Estate; a, Cudell & Richardson.

Vincent st, br and stone bldg; cost, \$17,000; o, J. A. Vincent; a, Smith & Daniels; b, H. Lindhorst.

5th av, fr bldg; cost, \$5,000; o, M. F. De Forrest; a, Smith & Daniels; b, W. J. O'Neill.

Chestnut st, fr bldg; cost, \$5,000; o, Wilson Dodge; a, Smith & Daniels; b, J. W. Hill.

DULUTH, MINN.—A. Fitzer & Co. are soon to begin work on a 3-story storage-house, 70x100 feet, adjoining their brewery on East Superior street. It will cost about \$40,000.

The organization of a new elevator company, headed by A. J. Sawyer, has been about completed, and work will begin at an early day upon a new system of elevators here. They will be five in number, and have a capacity of about 6,000,000 bushels.

H. M. Carpenter, of Averill, Carpenter & Co., Minneapolis, has been in Duluth with a view, it is said, of locating a wood-pulp mill.

DETROIT.—In progress Y. M. C. A. Building, corner stone laid October 19, cost \$250,000.

43 Canfield, br dwell; cost, \$10,000; o, M. A. Edwards; a, M. L. Smith; b, John Edwards.

56 19th st, br dwell; cost, \$10,000; o, St. Ann's Society; a and b, A. E. French.

BUILDING INTELLIGENCE.

DETROIT, MICH.—107 Elizabeth, br dwell; cost, \$10,000; o, J. B. Lauder; a, A. E. French; b, Spitzley Bros.

151 High, br dwell; cost, \$10,000; o, A. F. Hoke; a and b, A. E. French.

ELGIN, ILL.—Br and stone block, replacing one burned; cost, \$23,000; o, M. W. Du Bois; a, C. L. Stiles; b, not let.

ENGLEWOOD, ILL.—3 br dwells; cost, \$10,000; o, Fluke & Crain; a, W. L. Carroll.

ERIE, PA.—324 W. 10th st, 2-story fr bldg; cost, \$3,400; o, I. A. Forman; b, G. W. Fasset.

817-19 Peach, 2-story br bldg; cost, \$8,000; o, Edison Electric-Light Co.; b, E. McHaffey; plant complete, cost, \$20,000.

MONTREAL, CAN.—Perrault & Mesnard, architects, of this city, have prepared plans for a church in the village of St. Anicet, Huntingdon County. Contracts not yet awarded.

MINNEAPOLIS, MINN.—2002 2d av, S, double wood dwell; cost, \$20,000; o and b, W. H. Groff; a, Groff & Chamberlain.

2912 Blaisdell av, ice house; cost, \$5,000; o, Cedar Lake Ice Co.

816 Hawthorne av, br dwell; cost, \$12,000; o, Hutchins & Brace; a, Orff Bros.

1714 Nicolle av, br dwell; cost, \$8,000; o, E. J. Phelps; a, Long & Kees.

1510 8th av, N, wood dwell; cost, \$5,000; o, C. C. Phillips; a, C. S. Sedgwick.

NORFOLK, VA.—Water, nr Commerce, 3-story stone bldg; cost, \$5,000; o, M. L. Davis; a, George C. Moser; b, Keeling & Fletcher.

Ferry Dock, ferry house; cost, \$4,046; o, County; a, same as last; b, H. S. White.

York, 2-story res; cost, abt, \$3,500; o, Mrs. J. J. Johnson; a, same as last; bids open Nov. 1.

Bute st, residence; cost, \$2,700; o, A. Milhado; a, same as last; b, Denis Parlett.

Bute st, residence; cost, \$7,000; o, Liman; a, Cassell & Cassell; b, H. S. White.

Fremason st, residence; cost, \$6,000; o, G. W. Taylor; a, same as last; b, Denis Parlett.

PHILADELPHIA.—Frankford rd, bet Hall and Ann, dwell; b, Samuel H. Brown.

Eastburn, bet Limekiln Pike and Township Line, 2 dwells; b, Martin Hetzel.

ST. LOUIS, MO.—Laclede and Theresa avs, 2 adj br dwells; cost, \$10,000; o, Mrs. V. I. Paul; b, O'Connell & Mulamphy.

Lindell and Newsteat avs, br dwell; cost, \$14,000; o, M. Hays; a, C. F. May; b, sub-let.

Bell and Sarah avs, br dwell; cost, \$5,000; o and b, J. Guedry.

Leonard and Easton avs, 3 adj br dwells; cost, \$7,000; o, William J. Hegel; b, sub-let.

Olive st and Vandeventer av, br dwell; cost, \$5,000; o, J. C. Love; a, J. Stewart & Co.; b, J. B. Asper.

Jefferson and Beaumont avs, br dwell; cost, \$6,800; agent and b, J. D. Fitzgibbons.

22d and Gratiot sts, 6 adj br dwells; cost, \$6,000; o, W. Edenborn; a, C. C. Hellmers, Jr.; b, sub-let.

Osage st and Broadway, br dwell; cost, \$7,000; o, H. Holtmann; b, sub-let.

Olive st and Cabanne av, br dwell; cost, \$5,500; o and a, J. B. Legg; b, sub-let.

Washington and Sarah avs, br dwell; cost, \$15,000; o, Mrs. J. H. Clements; a, C. C. Hellmers, Jr.; b, G. W. Farnum.

Grand and Sullivan avs, br dwell; cost, \$5,000; o, T. Bick; a, W. J. Gains; b, J. Gagee.

Henrietta and Todd avs, br dwell; cost, \$7,100; o, J. Johnanson; b, A. Uhri & Son.

22d and Pine, br factory; cost, \$6,000; o, J. Rapp; b, T. F. Marley.

BUILDING INTELLIGENCE.

ST. LOUIS, MO.—Washington and Vandeventer avs br dwell; cost, \$6,000; o, E. A. Bayrd; b, S. P. Johnson.

Westminster and Cabann avs, br dwell; cost, \$6,500; o, W. L. Seott; a, L. C. Bulky; b, J. Low.

Laclede and Baylis avs, br dwell; cost, \$6,000; o, J. Purcell; a, G. W. Pipe; b, E. E. Pipe.

30th and Pine st, br dwell; cost, \$10,000; o, Mrs. M. E. Brownell; a, J. B. Legg; b, L. W. Manning.

Delmar and Sarah avs, 3 adj br dwells; cost, \$15,000; o, H. Burnett; b, J. B. Lindsley.

19th and Exchange sts, 2 adj br dwells; cost, \$5,000; o, M. B. Scanlon; a, J. B. Reed.

Collins and Wash sts, 2 adj. warehouses; cost, \$10,000; o, H. Overstolz; a, I Taylor; b, Gösse & Remmers.

ST. PAUL, MINN.—Summit av, bet Nelson and Iglehart, 2-story fr dwell; cost, \$5,000; o, A. P. Warren.

—st, bet College and Summit av, 4-story dwell; cost, \$6,000; o, Trustees Minnesota Church.

5th, bet Wabasha and Cedar, 2-story br addn to hotel; cost, \$5,000; o, A. R. Capehart.

BOOKS AND PAMPHLETS RECEIVED.

REPORT ON THE QUARANTINE SYSTEM OF THE ST. LAWRENCE. Approved and adopted by the Provincial Board of Health of Ontario, 1886. Toronto: Warwick & Sons, Printers.

AUGUSTA, GEO., PUBLIC DOCUMENTS: Mayor's Message; City Officer's Reports; Report of Board of Health for the year 1885. Published by order of the City Council of Augusta. pp. 142. Chronicle Print.

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U. S. CONSULAR REPORTS on Commerce, Manufactures, etc., of their Consular Districts. No. 65, July, 1886. Published by the Department of State according to Act to Congress.

WITHIN THE HOSPITAL WALLS. A matter-of-fact narrative, arranged by Henry C. Burdett. First Hospitals Sunday Supplement of the *Lancet*. Ballantyne, Hanson & Co. London. 1886. pp. 16.

SECOND ANNUAL REPORT OF THE NEW YORK STATE DAIRY COMMISSIONER. With accompanying documents. Transmitted to the Legislature, January 27, 1886. Albany: Weed, Parsons & Co. pp. 423.

ANNUAL REPORTS OF CITY OFFICERS OF ROCK ISLAND, ILL., for year ending April 16, 1886.

REPORT OF THE DEPARTMENT OF HEALTH OF THE CITY OF CHICAGO, for the year 1885. Chicago: Cameron, Amberg & Co., Printers. pp. 124. With colored plate.

SEVENTH ANNUAL REPORT OF THE STATE BOARD OF HEALTH, LUNACY, AND CHARITY OF MASSACHUSETTS. With Supplement containing report, papers on public health, and general index. Boston. 1886.

MAIN SEWAGE SYSTEM. Intercepting and Outfall Sewers. Report to Toronto, Ont., Council, September. 1886.

[TOO LATE FOR CLASSIFICATION.]

GOVERNMENT WORK.

NEWPORT, R. I.—Bids for the following works were opened by Colonel Elliot, U. S. Engineers, October 27. The aggregate of the amounts to be expended under the contracts to be awarded is about \$150,000. The prices for the rip-rap granite are per ton of 2,240 pounds. The prices for the dredging are per cubic yard, measured in scows:

Rip-rap granite for the Eastern Jetty at Nantucket Harbor of Refuge, Mass.—John A. Bouker, New York City, \$2.16½; James V. Luce, Niantic, Conn., \$2.18; James Scully, Groton, Conn., \$2.24; Mount Waldo Granite Works, Frankfort, Me., \$2.47; Charles H. Edwards, Quincy, Mass., \$3.31.

Rip-rap granite for the eastern breakwater at Stonington Harbor of Refuge, Conn.—John A. Bouker, New York City, \$1.02½; William H. Molthrop & Co., New London, Conn., \$1.12; James Scully, Groton, Conn., \$1.13; James V. Luce, Niantic, Conn., \$1.17; Mount Waldo Granite Works, Frankfort, Me., \$2.47.

Dredging in Hyannis Harbor of Refuge, Mass.—Frank Pidgeon Dredging Co., New York City, 14½c.; Alonzo J. and George B. Beardsley, Bridgeport, Conn., 16c.; National Dredging Co., Wilmington, Del., 20c.; John McDermott, Cohoes, N. Y., 24½c.; Hartford Dredging Co., Hartford, Conn., 25c.

Dredging in Pawtucket River, R. I.—Elijah Brainard, New York City, 25c.; Richard M. Payn, Albany, N. Y., 26c.; Morris & Cummings Dredging Co., New York City, 29c.; P. Sanford Ross, Jersey City, N. J., 30c.; Thomas H. Benton, Elizabeth N. J., 30c.

Dredging in Providence River, R. I.—William H. Beard, Brooklyn, N. Y., 8½c.; Atlantic Dredging Co., Brooklyn, N. Y., 8½c.; P. Sanford Ross, Jersey City, N. J., 10c.; Morris & Cummings Dredging Co., New York City, 10½c.; National Dredging Co., Wilmington, Del., 13c.

Removal of Green Jacket Shoal, Providence, R. I.—William H. Beard, Brooklyn, N. Y., 10½c.; Atlantic Dredging Co., Brooklyn, N. Y., 11½c.; P. Sanford Ross, Jersey City, N. J., 14c.; Elijah Brainard, New York City, 15c.; National Dredging Co., Wilmington, Del., 16c.; Morris & Cummings Dredging Co., Jersey City, N. J., 18c.

Dredging in Pawcatuck River, R. I.—Alonzo J. and George B. Beardsley, Bridgeport, Conn., 12½c.; Richard M. Payn, Albany, N. Y., 13½c.; Frank Pidgeon Dredging Co., New York City, 16½c.; Hartford Dredging Co., Hartford, Conn., 21½c.; John McDermott, Cohoes, N. Y., 23½c.; Morris & Cummings Dredging Co., New York City, 32c.; Elijah Brainard, New York City, 35c.

PROPOSAL.

IMPROVING JAMES RIVER, VA.—PROPOSALS FOR DREDGING.

U. S. ENGINEER OFFICE, 378 ST. PAUL ST., BALTIMORE, MD., Oct. 28, 1886.

Proposals for dredging material from the channel in the James River, Va., at Kingsland Reach, will be received until November 10, 1886, and opened immediately thereafter. Blank forms, specifications, and information can be had on application to this office, as well as at the U. S. Engineer Office, 905½ Main Street, Richmond, Va.

WM. P. CRAIGHILL, Lieut.-Col. of Engineers, U. S. A.

WATER-WASTE PREVENTION: Its importance and the evils due to its neglect. By HENRY C. MEYER, editor of THE SANITARY ENGINEER.

(From the Preface.)

"If the publication of this little book increases the popular appreciation of an urgent public necessity, and tends to secure for water-works officials who are striving to do their duty in the matter of restricting the waste of water the support of influential members of their community, the author will feel amply repaid for the labor involved in gathering and presenting this information."

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Comprises the twenty-six weekly issues from December 3, 1885, to May 27, 1886.

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Residence of George F. Baker, Esq., Seabright, N. J. Bruce Price, architect, New York.
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The Western Spires of the Cologne Cathedral. American Unitarian Association Building, Boston. Peabody & Stearns, architects, Boston.
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Disposal of Sewage of Almshouse and Insane Asylum, New Providence, R. I., from plan by Samuel Gray, C. E.—Illustrations and description.

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Details of Plumbing in residence of Mr. William A. Burnham, Boston; Mr. Edward Kilpatrick, New York; Residence at Newport, R. I.; George Lewis, Jr., New York; Henry C. Valentine, New York; Athletic Club, New York.

Form of Plumbing Specification for an isolated country house valued at \$3,000.

Specimen of Corroded Lead-Work from Naval Museum of Hygiene, Washington, showing action of sewer-gas on unventilated soil-pipes and traps.

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Besides those enumerated, a great variety of illustrated descriptions, answers to questions, novelties, etc., as well as references to matter of current interest to these industries.

SANITATION.

The usual reviews of reports of health officers, and comments on current questions of interest to sanitarians and health officers.

Construction and Building Notes.—In these columns will be found more items of interest to Contractors, Architects, and Engineers, such as projected work and awards of contracts, results of competitions for Public Buildings, Water-Supply, Sewerage, and Gas-Works, etc., than is found in other periodicals in the United States, largely collected by special correspondents.

THE SANITARY ENGINEER is obtainable of News-dealers everywhere, who can get their supply of papers from any of the Branches of the American News Company.

And if every plumber that is a member of the union will make it his business to attend the next meeting, and vote as his conscience tells him is right, this strike will soon be a thing of the past.

NEW YORK APPRENTICESHIP LAW.

Since we published the Apprenticeship Law of this State we have carefully read and considered it, and this has suggested the consideration of a point we have not yet heard discussed—namely, whether any man, master plumber or otherwise, is willing to assume the risks imposed by that law. The conditions of society and labor have so changed since the act was passed, that the impracticability of carrying it out in its present form should certainly be taken into account before it is made a subject of dispute.

To legally indenture a boy to-day involves risks that few employers would care to assume, the present act being so framed, that for any alleged infraction on the part of the master, he is liable to a criminal prosecution. If any disagreement with a boy occurred, it would not be pleasant to be summoned before a police justice and placed under bonds to appear at the Court of Special Sessions like a thief or a forger, and yet that contingency is not an improbable one under the present law, which was framed under different conditions of society than exist to-day.

If the masters' and journeymen's associations are really desirous of doing something to improve the character of the workmen, which both are on record as being, they can, after a reasonable time, agree on some practicable plan which may be a step in the right direction, but in this matter extremists on both sides should give way to practical and conservative men.

WHY A PLUMBER NEEDS A HELPER.

During the winter, after the soreness produced by this unnecessary strike is somewhat healed, the apprenticeship question can be taken up and calmly considered. Meanwhile the experience of the journeymen who have been working during the past seven weeks will doubtless have secured a modification of the idea that one helper is sufficient for four men; at any rate, we think it may be of interest to reprint an essay that secured a prize of \$25 on the subject, "Why a Plumber needs a Helper." This was published in THE SANITARY ENGINEER in 1878, and was written by Mr. James Scott, of Rochester, a journeyman plumber.

FIRST PRIZE ESSAY.

The benefits arising from the division of labor are familiar to every schoolboy, and are perfectly apparent to the ordinary observer who witnesses the operations of large bodies of workers in manufactories, where the same article is passed from hand to hand until it receives the finishing touches and is ready for the market; all engaged on it being but helps to its final completion. The division of labor between the plumber and his helper, if less apparent to the uninitiated, is nevertheless as beneficial and as much a matter of fact as in the case referred to.

As a measure of economy, it is the rule in the more laborious mechanical trades, to employ as much unskilled labor as the nature of the work will permit—a boilermaker having sometimes as many as six or eight helpers under his direction, the work being done as skillfully as if the same number of intelligent mechanics had been employed.

The plumber's helper is usually a young lad, tolerably strong, and if intelligent, so much the better for himself and the man he helps: his services are preferred to those of laborers, as being less expensive and his being somewhat quicker in his motions—a vital necessity in many instances—than laboring men generally are; he only does unskilled work, which, if done by a plumber, would be done, of course, at the price of skilled labor.

This, although commonly the rule in the United States, is not the case in Scotland or England, where the trade societies limit the number of apprentices or helpers; parties having plumbing work done being compelled to pay for the services of full grown men in many cases, where less expensive labor would answer equally well.

A helper's work, if not as continuous and laborious as that of the blacksmith's striker, is not by any means child's play, while his pay is very often in inverse proportion to his labors.

We will suppose that the plumber is sent to fit up a new house with all the usual fixtures, including a tank in the attic. The rough work, such as the iron soil-pipe, the supply and waste pipes to and from the various outlets, being put in first, the plumber commences by taking his measures to set up the stack of soil-pipe and preparing to cut a length where it is necessary to insert the outlet for the first floor; the helper meanwhile is busy lighting his fire to have the calking-lead in readiness by the time it is wanted. The pipe being measured, he steadies it while the plumber cuts it off, he assists in setting it up, holds the light if necessary, hands the plumber the packing, adds lead to the pot as it melts, keeps up his fire, carries to and fro the necessary tools, saving the time it would take the plumber to attend to these things himself; then carries his tools and materials to the next floor, where the same operation is repeated, after which comes the distribution of the supply and waste pipes, in which coils of pipe often weighing over two hundred pounds have to be unrolled or set up on studs, all perfectly straight—a task in many cases taxing the strength of both man and helper to the utmost, especially where floors have been laid and only pockets cut here and there.

The tank is next in order. The sheet-lead having been cut in the shop has to be carried to the attic, the helper taking his share of what is almost invariably a load of many hundred pounds. Once in the attic the lead has to be shaved, soiled, placed in the tank, and all made fast with nails, the plumber taking care that the helper is kept lively between assisting with the lead, getting the round irons and solder hot, and so on to the end of the job.

Any skeptic as to the necessity of a plumber having a helper, who will take the helper's place on some warm afternoon when there is a tough job on hand, will at least be able to convince himself one way or the other.

It may be urged that the carpenters on the same house had no helper. Very true, there were no helpers employed as such, but when one carpenter required help he called upon another to assist him—which the plumber could not do if alone, and from the nature of the work more than one plumber can seldom work to advantage in a house, unless a very large one, as they would only be in each other's way if two were employed, and one would be compelled for the greater part of the time to act as helper to the other.

Every plumber knows that if three houses, all requiring the same amount of work, were to be commenced at the same time by three men, all equally skillful—one with a good helper, one with a green helper, and one going it alone—the work would be finished in the order set down, with probably a considerable hiatus between each.

On job-work the helper is just as much of a necessity as he is on new, but, unfortunately, he does not find much favor in the eyes of those having job-work done. Much of the prejudice against the helper is caused by parties desiring repairs neglecting to send word as to what they believe is the matter. A man always takes such tools as are required to repair leaks, raise flooring, etc.—usually a tolerable load—only to find on his arrival at the job that there is packing for the valve or a new spring required, which he is compelled to send to the shop for. In almost every case this could be avoided if, in leaving the order, it was stated that the closet or wash-bowl, as the case might be, was out of order; the plumber, from his having done work in the house before, would know exactly what would be required. Of course, for those revolvers who never go twice to the same shop, but travel from one to another on the look-out for a cheap plumber, this hint will not be of much service.

It is a daily occurrence for an order to be left for some repairs on a house quite a distance away. To the inquiry as to what is the trouble, the gentleman doesn't know exactly, but guesses the trouble will be found in the bill (this as if he felt sure he could equal Mr. Alden as a comic writer on the plumber if he wanted to). This is, of course, a crusher; the humiliated plumbers shoulder their kit and silently depart for the funny man's dwelling, where they are informed by the lady that the waste of the basin is choked up, and that it has been "pumped out" ever so often, and that it is always just as bad as ever in a week or two. The plumber explains that the pipe has very little fall, and runs quite a distance. He suggests the advisability of raising part of the floor and removing the hair and pins with which the pipe is clogged. This idea is utterly repudiated. He is told with convincing emphasis that there is no possibility of such things being found, she is so careful, etc. The plumber being persistent, however, the lady resignedly supposes it must be done. The helper is then ordered off for the ratan or wire with which to clean the pipe, on which there is a demand in aggrieved tones to know "why they didn't bring their tools with them." The helper (usually the most aggressive of the two) informs her that he wanted to, but the grindstone and the forge were on another job. The lady retires, and the plumbers form the subject of conversation for the family during the evening, all mention of the hair, the pins, and the piece of whalebone found in the pipe being omitted. The trouble is found in the bill, of course, for "my wife says they didn't bring their tools with them, and the plumber just sat around all afternoon." Yet nothing would convince that man that it was his own fault that the plumbers were not fully employed from the time they entered until they left his house.

Again, an order is left to repair a leak in the lead pipe at the range. Off go Damon and Pythias, tools, furnace, pot, and all. On arriving at the job the helper starts his fire, while the plumber empties the boiler and gets the joint ready. The repairs are made without loss of time. There is no grumbling about not bringing the tools, and the bill is paid without complaint; all for the simple reason that the plumber knew just what to take with him, through being told what the trouble was.

In the cases referred to, it is within the bounds of possibility that the plumber might have been able to do his work without assistance by taking double the time, and running the risk, in the first case, of destroying the ceiling of the room below; but there are cases where the assistance of a helper is absolutely imperative—as, for instance, there is a leak under the floor in some closet which has been fitted up with drawers. The drawers are removed, and it is found that the frame is dovetailed together in such a manner that its removal would be its destruction. The plumber, however, discovers that by squeezing himself through the frame, which almost cuts him in two, he can manage to reach the leak and fix it by having the helper hand him the hot metal in small ladlefuls, as required. Now, if he had had no helper, what could he have done? He could not trust to any casual help he might find in the house, for he would scarcely care to run the risk of having the metal poured down the back of his neck by ignorant hands. If he cut away the frame, so that he could easily crawl out and in, the owner would scarcely fancy having to pay a carpenter's and then a painter's bill, in addition to the plumber's. It may be that in time the plumber will be expected to fill his mouth with solder, as lathers do with nails, and eject the molten stream as required; by which time he will find it more profitable to travel in combination with the African sword-swallower as a circus attraction than to perform the unnatural contortions he has daily to go through as a plumber.

That there are occasions when the services of a helper might be dispensed with I am not only willing to admit, but to give an instance that occurred in my own experience quite recently. Just before the dinner hour a man rushed in to say that there was a plumber wanted immediately, right away—the water was leaking all over, drowning them out, etc., etc. As the man was breathless from running and excitement, and his employer rather a good customer, I started with the usual accompaniment, only to find that the children had been playing with the knob of the water-closet pull and had unscrewed it,

no one knowing enough to screw it on again; the lady sweetly remarking that there was no need for two men coming to do such a little job, she thought—a sentiment in which I quite agreed with her. It seems she had called over the window to the messenger (who was employed in the stable in the rear) to go for the plumbers, and he went for them as stated.

That a helper is an hourly necessity to the plumber is an incontrovertible fact, understood by every one having the slightest knowledge of the business, and a convincing proof of the fact that it pays to allow a helper to each workman may easily be found by any one who takes the trouble to learn the manner in which contract work is performed. The most dishonest contractor that ever skinned a job never attempted to save money by having the plumber work alone; he has counted the cost and knows better.

I had no intention of writing a plea in behalf of the maligned plumber's helper, but before closing I cannot resist the temptation of saying a few words in his behalf. Few people look on him as anything else than an inevitable evil, forgetting that he is in reality as much a proof of civilization as the church, the school, the jail, or the newspaper, and therefore as much entitled to respect. It is objected by some fastidious people that he lacks refinement, that his personal appearance is often the reverse of captivating, and that his habit of leaving the trade-mark on the walls is a form of advertising not to be encouraged; all of which is very true, but, as the dying man said of his sins, "let by-gones be by-gones," for just as soon as college graduates in kid gloves can be procured at \$3 per week the plumber's helper as he now is will be abolished.

As for the plumber himself, a callous world has done but scant justice to his merits. The surgeon has risen high in the social scale since the days when the craft hung the brass basin from the striped pole, and combined the arts of easy shaving and blood-letting. Let us hope that time, which has done so much for him, will not forget that the plumber has claims equally good upon her remembrance; for hath he not also "filled untimely graves" by the same means—ignorance and carelessness?

Correspondence.

SANITARY CONDITION OF THE TREASURY BUILDING, WASHINGTON.

NEW YORK, October 9, 1886.

SIR: I noticed in your issue dated September 30 a statement regarding the defective plumbing in the Treasury Department, Washington, D. C., all of which, and more, I am sure, is perfectly true, and, if investigated, it will be found that all the Government buildings in Washington, excepting those in course of construction, including most of those rented for Government use, have defective plumbing similar to that described in your article, because the work was done before the introduction of the modern improvements in plumbing, such as ventilation of traps, etc., and was often executed by workmen employed directly by the Government.

Not only is the plumbing very defective, but the water-closet rooms are usually very offensive, on account of inadequate ventilation. For example, the writer knows from personal knowledge that the two long narrow water-closet rooms on each side of the basement entrance to the Treasury Building on Fifteenth Street are unmitigated nuisances. Each of these rooms contains about twelve water-closets and five urinals, which are used continuously, especially in the forenoons.

The effluvia from these water-closet rooms permeate the halls adjacent, and travel through the large wells of staircases to the corridors and rooms in the several stories above, polluting the atmosphere and rendering it injurious to health.

Numerous complaints have been made orally and in writing by the clerks occupying rooms in the stories above these two pest-holes to chief clerks (superintendents of the building *ex-officio*), resulting occasionally in an examination, with recommendations, sometimes, that the whole apparatus be torn out, or vent-shafts built through the rooms above. Small flues from each of these water-closet rooms were made, and a jet of gas is burned to assist ventilation, but these are entirely inadequate, and any one coming in from the open air must readily perceive the bad odors, especially during certain hours of the day.

You can easily imagine the quality of the atmosphere clerks occupying the rooms above have to breathe, particularly in the winter, when the windows in their rooms are kept closed to prevent draughts.

Whether the several chiefs have been unable to make requisite changes for want of appropriations or not I cannot tell, but the unfortunate illness of the present Secretary, it may be hoped, will compel a complete change in the ventilation, if not the location, of all such water-closet rooms in the Treasury Building, as well as an improvement in the plumbing. Very respectfully, DIXIT.

SMOKE-ROCKETS.

NEW HAVEN, CONN., October 24, 1886.

SIR: In THE SANITARY ENGINEER of September 2, page 322, is noticed an article on "Testing House-Drains," in which "smoke-rockets" are spoken of. Never having seen the article advertised, I would thank you to inform me where such can be purchased, and greatly oblige, Respectfully yours, EDWARD COE.

[Smoke-rockets were advertised in the issue of THE SANITARY ENGINEER of January 7, 1886, page 140. They are manufactured by James Pain, 9 St. Mary Axe, London, E. C.]

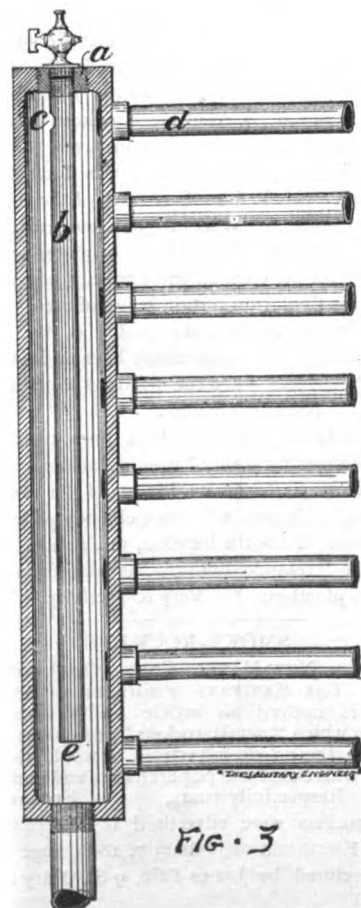
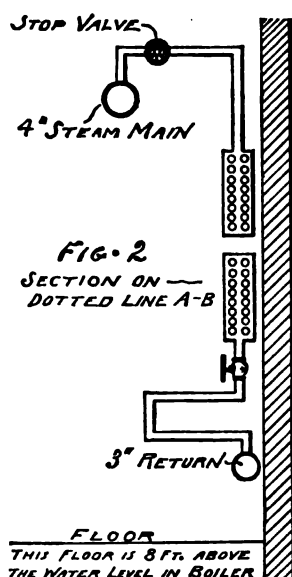
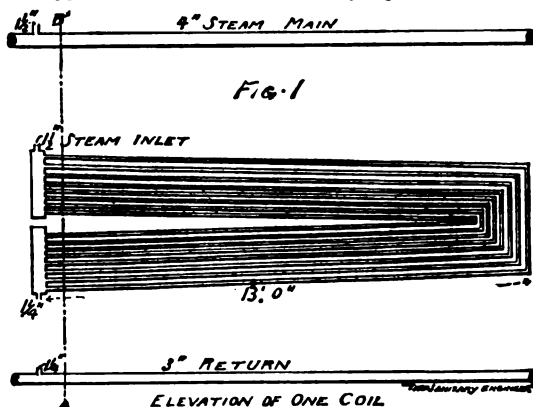
A PROBLEM IN DRAWING AIR FROM A MITRE COIL.

DESERONTO, ONT., October 16, 1886.

SIR: Inclosed I beg to hand you elevation and section of a double (or cluster) coil, a number of which are being placed here in a jail, to be run as a low-pressure (gravity) steam-heating apparatus.

Will you kindly let me know through your journal at what point, in your opinion, an automatic air-vent should be placed in order to relieve the coil of air in the shortest space of time?

You will observe by referring to elevation that the steam being admitted at top of header its tendency will be to heat the lower part of the top half and the upper part of the lower half of coil first, which would somewhat interfere with the action of the air-vent if placed at its usual position (upper end of lower header), and my experience has been



that when vents are placed at lower end of bottom header the steam entering from return-pipe (when return has to be carried above water-level) produces the same result and closes the vent before the air is fully expelled, thus leaving the lowest pipe in coil comparatively cool.

Respectfully yours,

INDEX.

[The accompanying sketch, Fig. 3, shows a method we have seen used to good advantage to overcome the danger you fear. Into the upper end of the lower header screw a bushing, *a*. Tap this bushing on the inner side and screw into it a drop-pipe, *b*. In the side of this pipe at *c* make a little hole (one-eighth of an inch), taking care that it faces away from the pipe *d* of the coil when screwed up. Have the pipe open at the bottom, of course, at *e*. Then an air-cock (automatic or otherwise) will draw off all the air and allow the whole coil to work.]

FLUE-AREA REQUIRED FOR HEATING A CHURCH.

LITTLE ROCK, ARK., October 20, 1886.

SIR: We have a church edifice approaching completion whose floor-area is 6,200 square feet, regular cruciform plan, and contents about 155,000 cubic feet. On each side, north and south, there is about 300 square feet window surface below, and about 150 square feet in clear story windows. At each end, east and west, about 100 square feet in windows. In front of the transepts, on each side, is a flue 6x18 inches intended for heating the church. We would prefer steam-heating, but there appears to be some doubt in the minds of some as to the capacity of the flues for that purpose. Will you kindly advise me what area of flue will be required to properly steam-heat the church?

This is written with the knowledge and consent of our present architect, Mr. B. J. Barlett, who, like myself, is a regular reader of your most excellent paper.

Respectfully yours,

J. H. HANEY,

Of the Building Committee.

[You have omitted to send us some very important data, namely: (1) The number of cubic feet of air per hour you wish to allow for each person; (2) the number of persons to be provided for; and (3) the area of the external walls of the building. The first, however, we can supply on the ground of what would be reasonable. The second can be assumed, but the last we cannot supply.

If we allow, therefore, 1,000 cubic feet of fresh air per hour for 800 persons, we will require to pass 800,000 cubic feet in an hour into the church. With ordinary indirect steam or hot-water coils with short flues, such as is usually obtainable in a church, the greatest velocity per minute that it is well to rely upon will be four feet per second. According to this, then, you will require about fifty-five feet of inlets. This is the extreme case, however, and we are sorry to say we can count on our one hand the number of churches that come anything near this in the matter of air admitted per capita.

A change of air every thirty minutes, however, is little enough to be provided for in a church, and this with a velocity of four feet per second requires flues aggregating twenty-one square feet in their cross-section. This is for warming and ventilating.

If you desire to know only the size of flues necessary for warming, we must consider the question in another form. Assume 1.5 cubic feet of air per minute to be cooled as many degrees Fahrenheit per square foot of glass in the windows as the inside air is warmer than the outside atmosphere. Assume that each eight square feet of outside wall cools as much air as one square foot of glass.

Find what this will be in heat-units for an hour.

Divide the product by 1,000 and call it pounds of steam condensed. Multiply this by three and call it square feet of radiating surface in coils.

Allow two square inches of flue, then, for each square foot of surface and you have approximately the size of flues required for warming (alone) by steam.

Two flues are not at all sufficient for such a church. Ten would be more likely the number required.

In the matter of ventilation, if a good aspirating-shaft can be secured, probably a velocity of six or seven feet per second may be assumed for the air, and with a forcing fan ten to fifteen may be allowed; but in these two latter cases the velocity at the registers or openings into the church should be reduced to between one and two feet per second.]

THE PROPER LOCATION OF FURNACE AIR-INLETS.

AKRON, O., October 8, 1886.

SIR: It is the custom hereabouts, and elsewhere, in arranging apparatus for heating houses by hot-air furnaces, to take supply of cold air from the hall near the floor,

pass it over the furnace and up into the apartments. The air thus heated, of course, becomes lighter and rises to the ceiling, and the cold, heavy, vitiated atmosphere descends to the floor. Now is there not a gross violation of sanitary rules in thus reheating time and again the same atmosphere?

Even granting the germ theory to be correct, and granting also that heating the cold air kills any germs it may contain, are there not other principles injurious to health in air that has been reheated over and over? In fine, do you consider it healthful and proper, from a hygienic point of view, to heat houses in this way?

Please answer through the columns of your journal.

Very respectfully yours,

ALBERT HOOVER.

[The fresh-air supply for a furnace—that is to say, the air which is to be warmed and sent up into the house—should always be taken from out of doors, never from within the house while the latter is occupied by living persons.

Air which has been in the lungs is unfit to be breathed again until it has been purified, because it contains too little oxygen and too much organic matter in the first stages of decomposition, and it should be largely diluted with fresh air before it is again inhaled.]

CEMENT PIPE FOR WATER-MAINS.

CHESTER, PA., October 23, 1886.

SIR: At a special meeting of the Borough Council of South Chester, held Friday evening, October 15, for the purpose of receiving bids for the laying of water-mains, among those offered was one for the Phipps patent hydraulic-cement pipe, made in New Haven, Conn. Have you any knowledge of such pipe? If so, would you advise them to adopt said pipe for their street-mains? We would be very much pleased to hear your opinion of the same. At the same time, can you inform us how their ferrule attachments are made, and whether it makes a good substantial job? A committee was appointed to inquire into the merits of the pipe, and, on Wednesday last, in company with the manufacturers' agent in this locality, visited New Haven, where it is manufactured and have it in use, and were very well pleased as to its merits, etc. At another meeting of the Council last evening, they were on the point of adopting the pipe, when letters detrimental to its use were read, and, as a consequence, it was decided not to award contracts until the first Monday night in November. Thinking you would have a large knowledge of the pipe, and you being a good reliable party to make inquiries to, we would be pleased to receive your opinion, whether detrimental to its adoption or as to its good qualities. An early reply will greatly oblige, Yours respectfully,

GARTSIDE & TURNER.

[Cement-lined sheet-iron pipe have been extensively used in some cities in the Eastern States. So far as we are advised they have not proved entirely satisfactory, and most water boards and companies which adopted them have used cast-iron pipe in extensions of their mains. Among other objections they have proved to be more liable to being struck and injured by lightning. Another difficulty, the rusting of the sheet-iron casing, is claimed by Mr. Phipps to be obviated by making a double casing, and he also uses neat cement without sand. The attachment of service-pipes is now made by a special nipple made in the pipe. Whether the improved methods of manufacture will result in producing a durable pipe is still an open question.]

CORRECTION.

MR. J. A. FISH, of Boston, Mass., informs us that the amount of heating surface in the building mentioned in his letter, printed on page 498 of our last issue, should be 4,700 square feet, and not 47,000 feet as printed.

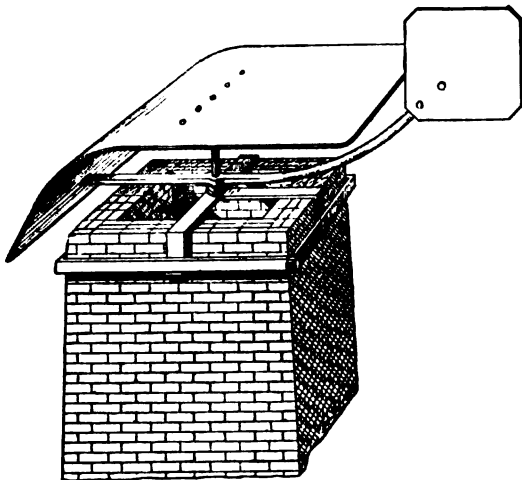
Novelties.

Under this heading we propose to describe and illustrate appliances of probable interest to our several classes of readers. The selection will be made without reference to the wishes of agents or patentees, being governed solely by considerations of novelty, ingenuity, and probable interest to readers, and especially the fact that they have not been elsewhere described. As a rule we shall make no comments, and it is to be distinctly understood that a notice does not imply approval. No charge will be made for these notices, and any offer of pay for their insertion will insure their omission. We shall be glad to have our attention called to novelties suitable for this section.

APPARATUS FOR PREVENTING WINDS FROM INTERFERING WITH THE DRAUGHT OF A CHIMNEY.

THE accompanying sketch shows a novel chimney-protector which swings with the wind, the object being to prevent downward draughts in strong winds, and, if possible, to assist the upward current by induction.

It consists of a hood of sheet-metal, the lower edge of which comes below the plane of the top of the chimney.



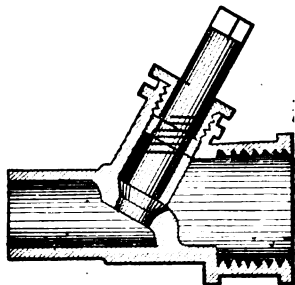
This hood has a weather-vane on it to keep its back to the wind, and the whole is supported on a spindle attached to the top of the chimney by an iron spider and a band as shown.

The inventor is Mr. J. H. Bailey, of Leading Creek.

STOP-FERRULE FOR BALL-COCKS.

THIS stop-ferrule is designed to enable the plumber to repair a leaky tap in any part of the house without turning off the water from the whole house.

Should a new cock be required this ferrule (or thimble) may be closed, the old bibb taken out, repaired, or a new one put in.



Its use behind a ball-cock enables the supply to be controlled as well as facilitating the removal of obstructions or the making of repairs. The inventor is Mr. D. T. Bostel, of Brighton, England; the manufacturer the Hygienic and Sanitary Engineering Co., Limited, 23 Charing Cross, London.

Gas and Electricity.

Illuminating Power of Gas in New York City.

Week ending	New York Gas-Light Company.	Manhattan Gas-Light Company.	Metropolitan Gas-Light Company.	Mutual Gas-Light Company.	Municipal Gas-Light Company.	Krickerbocker Gas-Light Company.	Equitable Gas-Light Company.
October 23,	26.61	21.90	21.98	31.44	30.16	22.38	30.31

E. G. LOVE, Ph.D., *Gas Examiner.*

THE London *Globe* calls on inventors to devise some "appliance which, acting automatically, would insure the gas being turned off the moment the occupant of a room got into bed." It suggests that possibly the pressure of the recumbent figure might be utilized for the purpose.

OUR readers are more or less familiar with the Fahnehjelm incandescent gas-lamp, which consists of a comb of some refractory material suspended over a flame of water-gas. The burner heretofore exhibited was a flat-flame, but the same principle has recently been applied to the argand.

LIGHTHOUSE ILLUMINATION.

AT the meeting of the British Association at Birmingham a number of papers were read on the subject of lighthouse illumination. One by Dr. Hopkinson considered the application of electricity to this purpose, while Mr. J. R. Wigham read several short papers of the general subject. The most elaborate paper, however, was that of Sir James N. Douglass, as President of the Mechanical Science Section, on the "Development of Lighthouses,

Light-vessels, Buoys, and Beacons, together with their mechanical and optical apparatus." From this paper it appears that in 1860 the total number of coast lights throughout the world did not exceed 1,800, whereas the present number is about 4,000. The United Kingdom has 655, the United States 458, France 413, British America 380, Sweden and Norway 329, and Italy 237. The greatest increase within the twenty-five years is seen in British America, which, in 1860, had but ninety-one coast-lights. At that time Japan had not a single lighthouse, and China had only four. Now, Japan has fifty-seven, and China fifty-five.

In 1759, Smeaton's lighthouse on the Eddystone was illuminated by twenty-four tallow candles, weighing two-fifths of a pound each, and was not provided with optic apparatus. The aggregate intensity of this light was sixty-seven candle-units, and the cost such as to provide, at the present time, a mineral-oil light, with suitable optical apparatus, of about 2,400 times the above-mentioned intensity.

In 1857, by the advice of Faraday, the electric arc as a lighthouse luminary was first introduced experimentally at Blackwall, and in the following year it had its first important application at the South Foreland High Lighthouse. It was not until 1872, however, that the electric-light was introduced in both the high and low lighthouses at the South Foreland. The French authorities adopted the arc-light at the Cape La Hève lighthouse in 1863. In 1862, experiments were made at the South Foreland with the Drummond, or lime-light, but the results were not so satisfactory as to encourage its adoption. Previous to 1869 colza-oil was generally used for oil-lamps in lighthouses, but in that year a change was made by the English authorities to mineral oil.

It was stated that there are at present not less than eighty-six distinctive characters in use throughout the lighthouses and light-vessels of the world.

With regard to fog-signals, there are now about 700 of these, of various descriptions, on the coasts of the world. The "Siren" is the most efficient fog-signal known at present.

The light-vessel, as an aid to navigation, was first employed in 1732; and from a small lantern with a flat-wick oil-lamp they have increased in light intensity to 20,000 candles in some instances.

In speaking of buoys and beacons reference was made to the Pintsch gas-buoys which burn continuously for three to six months, according to size, without any attention.

Mr. Douglass concluded his paper by referring to the experiments recently made at the South Foreland on gas, oil, and electricity as lighthouse illuminants, in which it was demonstrated that in all states of the atmosphere, from clear weather to thick fog, the electric-light was greatly superior to both gas and oil. As between these two latter illuminants it was found to be only a matter of economy, mineral oil having a considerable advantage.

SANITARY ADMINISTRATION IN FRANCE.

FOR a long time the physicians and sanitarians of France have been calling attention to the unsatisfactory condition of public health matters in that country, urging that the small rate of increase of population, due to a low birth-rate and a comparatively high death-rate, is fraught with danger to the future prosperity and power of the State, and that the chief practical means of averting this danger is the adoption of systematic means of improving the sanitary condition of the people.

The organization for sanitary work throughout the country is essentially that provided by the law of 1848, the principle of which is to create advisory councils of hygiene for each district of the country. But these councils, or boards of health, have only advisory powers, are unprovided with funds, and for much the greater part of France have only a nominal existence. No effective provision is made for the execution of the laws which exist relative to matters affecting the public health, the duties pertaining to this branch of administration being scattered among various officials, and the responsibility being thus so divided as to be practically non-existent.

Within the last five or six years several attempts have been made to secure legislation on this subject, and public opinion has been so far aroused that several candidates for election to the central legislative body have thought it worth while to announce through the press, or by their speeches, that they were in favor of the passage of a new law.

A bill for such a law has been now introduced into the Chamber of Deputies, and its provisions are of interest as indicating the tendency of public opinion on this important subject. It provides for the creation of a Bureau of Public Health, charged with the duty of recommending, supervising, and carrying out sanitary work in accordance with the laws, decrees, and regulations relating to that subject, and more especially in all which relates to the sanitation of cities, purity of water-supplies, the construction of public buildings, such as schools, prisons, hospitals, etc.; sanitary management of schools, hospitals, asylums, and charitable institutions; sanitary conditions of factories, workshops, mines, etc.; sanitary police and quarantine, vaccination, care of the health of infants; the quality of food, drink, and medicines exposed for sale, and the subject of vital statistics.

The central body of this organization is to be a National Council of Public Health, composed of 37 members, including among others, two senators chosen by the Senate, two deputies chosen by the Chamber of Deputies, three members of the Institute of France, two members of the Academy of Medicine, the surgeons of the army and navy, and of certain professors from the schools of architecture, engineering, mines, etc., the President of the Chamber of Commerce of Paris, etc. In each department is to be, also, a council of health, composed of not less than nine nor more than twelve members, who are named by the Prefect. At least one-half of these are to be physicians, and these councils are presided over by the Prefect of the department. None of these have any executive or administrative power. They are simply to formulate their conclusions on questions submitted to them by the Government, or by the heads of departments, and to notify these conclusions to the proper administrative department. What this administrative department is, or under what obligation it may be to carry out the conclusions of the council, does not appear in the proposed law.

The Minister under whose direction this proposed Bureau of Public Health is to be placed is to be determined by the President of the Republic. The amount of money to be used in each department for sanitary purposes is to be fixed by the Prefect, with the concurrence of the department health council, and is then to be submitted to the Minister for approval. One-half of the amount allowed is to be furnished by the State, the other half by the Department.

It will be seen that the machinery provided to give advice is somewhat cumbrous, and it does not seem probable that the councils under the new law will be more effectual than those existing under the old one.

The need of France seems to be for a consolidation and simplification of the executive machinery, to provide for doing instead of talking in matters affecting the public health, and this need the proposed law does not appear to supply.

SANITARY WATER ANALYSIS.

AN interesting paper on the Wanklyn method of water-analysis has been contributed by Dr. Charles Smart to *Public Health in Minnesota*, the official publication of the State Board of Health. The paper refers particularly to the detection of recent sewage and the determination of the nature of the organic matter.

With regard to the various methods of water analysis, the author holds that while the microscopical and biological methods may in time supersede the purely chemical methods, the work in this line must for the present be performed by chemical processes.

Attention is called to the errors that may arise in the Wanklyn method: first, from the imperfect condensation of the evolved ammonia, and second, from not allowing sufficient time for the conversion of the nitrogenous matter into ammonia by means of the alkaline permanganate.

The most important part of the paper refers to the detection of recent sewage. Professor Wanklyn claims that urea does not evolve any of its nitrogen as ammonia when treated with an alkaline solution of permanganate. Dr. Smart, on the other hand, asserts that urea will yield all of its nitrogen as ammonia when sufficient time is allowed for the permanganate to act. He then goes on to show the peculiar behavior of urea under the permanganate treatment, that it differs from all other substances in the persisting and equable evolution of both free and albuminoid ammonia, and that these ammonias are yielded in the ratio of 1 to 2. He also claims that an approximate estimation of the amount of urine in a water can be arrived at.

Dr. Smart differs from Professor Wanklyn's statement that a water containing vegetable matter yields its albuminoid ammonia slowly when treated with permanganate solution, and he shows that "the rapidity of the evolution was determined by the instability of the matter, or its tendency to a state of putrescence rather than by its derivation." The yellow color which is sometimes noticed in a sample of water on the addition of carbonate of soda, and also the green coloration subsequently interfering with the Nesslerizing of the distillate, are "regarded as indicating the presence of non-nitrogenous vegetable substances in the progress of fermentative change."

The author's views on this point are summarized as follows:

A water yielding up the nitrogen of its organic constituents slowly as albuminoid ammonia contains *recent organic matter*: Of animal derivation, if a small quantity of oxygen be required to oxidize it by the Kubel or Tidy process; of vegetable derivation, if a large quantity of oxygen be required.

A water yielding up the nitrogen of its organic constituents more rapidly contains *decomposing organic matter*: Of animal derivation, if a small quantity of oxygen be required to oxidize it, and if there be no interference with the development of the true ammonia coloration during Nesslerization; of vegetable derivation, if a large quantity of oxygen be required and if a yellow coloration be developed in the water on the addition of sodium carbonate and a greenish color interfere with the estimation, particularly of the free ammonia, by Nessler's method.

REPORT OF THE HEALTH COMMISSIONER OF ST. LOUIS, MO.

A CONSIDERABLE part of General John D. Stevenson's report as Health Commissioner of St. Louis, nominally for 1884-85 but really for 1885-86, is devoted to a list of the wells of the city, 6,640 in number, giving for each its location, and, for 4,473 of them, the number of grains per gallon of chlorine as determined by analysis, the proportions ranging from one to thirty-two grains per gallon. While there is no doubt that the vast majority of these wells are polluted or in danger of pollution, it is not possible, in the face of the strong opposition to the closure of such wells which exists, more especially among the foreign population, to enforce by legal process the closure of wells upon evidence resting solely on the proportion of chlorine found in the water.

The death-rate is reported as 18.7, a reduction of 1 per 1,000 from the rate of the previous year. The Health Commissioner, General John D. Stevenson, calls attention to the fact that there were 426 deaths from diphtheria and 164 deaths from scarlatina reported during the year, and declares his intention henceforward to recognize them as contagious diseases, to require every practicing physician to report to the commission all cases of this class within twelve hours after he is called to attend the case, to placard the houses, to recommend private funerals, and to cause all dwellings wherein such diseases have existed to be promptly and thoroughly disinfected. He also very properly says: "We want an officer skilled in sanitary work, practically familiar with the local conditions that are known to be the active agents in developing this class of diseases, and with full authority to enforce such rules and orders as the Board of Health shall deem necessary to enforce a healthful condition. To intrust this work as is now done to temporary employees without skill or training is a delusion and a snare, the real causes of danger are rarely reached, the proper remedies seldom applied, a false security is created, and the fateful results continue."

The hospitals of St. Louis appear to be greatly overcrowded, and there is urgent need for new and properly planned buildings for this purpose. A great amount of cleaning up, drainage of ponds, and other sanitary work has been done during the year, but, unfortunately, the work had to be stopped in the autumn for want of funds.

The Chief Sanitary Officer, Mr. Francis, observes that "the plan of cleaning the city in summer and allowing it to become filthy in winter is bad and short-sighted, and no real and lasting sanitary results can thus be gained."

Altogether the report shows that much good work has been done and with good results, but that there is much yet to be done which cannot be accomplished by spasmodic efforts under the influence of a "scare," and which requires persistent effort under the direction of skilled officials.

AMERICAN PUBLIC HEALTH ASSOCIATION ON RAG DISINFECTION.

THE action of the association on a report on rag disinfection alluded to in our report of the Toronto meeting was as follows:

Whereas, It is an admitted fact that the importation of rags is a prolific source for the spread of infectious disease, and that the seaboard cities which are ports of entry are the gateways through which this infection enters and is distributed throughout various sections of the country; and,

Whereas, There are grave doubts as to the efficacy of the methods of disinfection used abroad; therefore,

Resolved, That it is the judgment of American Public Health Association that all health authorities having jurisdiction over matters connected with maritime sanitation owe it as a duty to the general public to adopt such uniform systems of disinfection as will thoroughly destroy all disease-bearing germs before the rags are permitted to be distributed for manufacturing purposes.

The Executive Committee recommended that the word "uniform" be struck out, and the following added to the resolution:

"If it proves to be impracticable to disinfect them, it is recommended the disinfection may be commenced in quarantine sufficient to insure safety in transportation, to be completed in the manufacturing establishment by such methods as the health authorities may prescribe."

The association voted to accept the recommendation of the Executive Committee, and the resolutions were passed as amended.

FROM a careful consideration of various parts of the report described as the annual report of the Board of Health of the city of Waltham for the year ending January 3, 1886, it seems fair to infer that this particular Waltham is the city of that name situated in Massachusetts, and not the Waltham of Maine, of Iowa, or of Nebraska, but in future reports it would be well to name the State on the title-page. Waltham has had a board of health for five years, but this is the first report made by that body, and a very good report it is, containing much information in a compact form. Waltham contains 1,706 inhabited houses, in which are 2,710 families, containing 9,139 adults and 4,045 children, or a total population of 13,184. Of these families, 2,232 use the city water-supply, the remainder using wells and springs. There are 1,914 cesspools, and 1,665 privies which require cleaning; 599 of the privy-vaults and 1,715 of the cesspools drain into the surrounding soil. Fifty-nine old wells are used as cesspools. These and other interesting data are derived from the result of a systematic sanitary survey of the city, which resulted in correcting about 900 sanitary defects and nuisances. The death-rate for the year was 16.5 per 1,000, which is a fair average for a city of this size. The Board of Health of Waltham has evidently clear ideas as to its duties, and is performing them. We hope that the series of reports thus begun will continue.

ARTESIAN WELLS AT DES MOINES, IOWA.

BORINGS in the north-eastern part of the city of Des Moines, Iowa, show that there are three distinct water-bearing strata within 1,400 feet from the surface, the water of which when tapped rises to the surface with a strong flow.

There is an evident underground water-course in that part of Iowa, quite narrow but many miles long. Pumping from a well sunk by the Standard Coal Company, near Angus, thirty-eight miles north-west of Des Moines, dried up one well two miles to the south-east and lowered the water eighteen feet in one two miles to the north-west.

CHEAP GAS FOR BALTIMORE.

ASSOCIATED PRESS dispatches from Baltimore, dated October 26, state that the new Chesapeake Gas Company has been fighting the old Consolidated Company for over a year, and the war has brought the price down to 50 cents per 1,000 feet in the competitive districts. The Chesapeake directors, several of whom are New Yorkers, where much of the stock is owned, decided to increase the capital from \$1,500,000 to \$3,000,000 to provide for additions to the work and extensions of mains so as to increase the capacity to 1,200,000,000 feet per annum, and thus be able to supply the whole city. The stockholders' meeting will be held next month, but it is said that all the new shares have already been subscribed for. Orders were given to make the contracts for the new work at once.

THE SEPARATE SYSTEM OF SEWERAGE—ITS THEORY AND CONSTRUCTION.

THIS is a well-printed volume of some 180 pages, the object of which, as stated in the preface, is "to explain what the separate system is, what it is designed to do, and to give practical directions for designing and constructing sewers in accordance with that system."

The author continues by the very sensible statement that "no single design, however complete in all its details, will be best adapted to every case. Each town will present some features peculiar to itself, and the general plan must be modified to suit the conditions of each case. All that is here attempted is to give sufficient theory, data, and results of experience to guide in properly designing and constructing sewers on the separate system."

This work is doubtless calculated to meet a real demand among civil engineers who may be called upon to plan and execute sewerage works for small communities without such previous special experience as seems to have been acquired by the authors. It is not a book, however—nor are we ever likely to have one—that will enable municipal boards to dispense with professional help in planning and executing such works.

The profession of the civil engineer has of late been developed in such a vast number of special branches, that no practitioner of less than miraculous powers can pretend to keep informed of the best practice in details in various branches to which his attention has not been especially directed. Nevertheless, a work of this kind will do much to assist any trained engineer who may have for the first time to undertake a task of this sort, by enabling him to see at once the governing questions that are to guide his course and to profit by the experience of others in similar paths. An introductory chapter is given to the subject of the needs of sewers, and two others to a description of the general features of the "combined" and "separate" systems, all of which are more useful for edifying a municipal board than their engineer, for such a person, if well chosen, can hardly have failed to see this sort of matter before.

Following these are several chapters containing valuable data and results of experiments, well arranged for reference in tabular form, and in some cases made still more terse by ingenious graphical illustration.

Other chapters treat of materials to be used, various details of construction, and of flushing and ventilation, house-drainage and plumbing, administration, cost, and assessments. Good illustrations are given of typical forms of work, such as have met the approval of conservative authorities.

The comparatively recent development of this system of sewerage has been too limited in its extent to allow of any extended experience in its application. The advice here found is therefore limited to the suggestions born of and the experience acquired in the construction of such work in one or two towns only. So far as these towns are typical, this experience is available for similar places, with such adaptation as would suggest itself to an engineer of ability. He would thus conform to the conditions surrounding the place he has to treat.

As indicated in the paragraph above quoted from the preface of this book, many of the details here recommended, however well adapted to the conditions where this work was done, the local climate, soil, and materials at hand, would need essential modification in any other locality. It is for this reason that an educated and practiced engineer would always be needed in executing such works.

Though we agree with most of the author's recommendations, both in general and in detail, we have the following criticisms to make:

It is recommended, on page 79, to lay 4-inch stoneware pipe for house-drains on a slope of one in sixty, but we doubt the propriety of using such small pipes at all, except in short branches. The theory which leads to using such smaller sizes is a correct one, and is well stated in this work; but the objection arises from practical difficulties—viz., the imperfections in the form of the pipes as now made, even by the best makers. It is more difficult to execute good interior lines without offsets at the joints in small pipes than in large ones, and such imperfections do exist in nearly all pipes now made. They arise partly from careless handling while soft, and still more from warping while in the kiln.

Moreover, we are inclined to favor the use of loose rings at the joints for all pipes of six inches diameter and larger size, instead of fixed sockets, for the reason that a better alignment can be had without the fixed sockets, and more exact concentricity at joints, by outside inspection, in this way.

The gasket of oakum, though possibly of use when using fixed sockets, is an objectionable feature, because oakum is a porous and a perishable material, occupying space that should be filled by an impervious and imperishable one. There is always an open space between the end of the spigot and the shoulder of the bell or socket for a part of its circumference which the oakum does not fill, but which cement would, and if properly wiped inside would give a smooth, continuous surface. This opening is quite as likely to occur on the bottom of the pipe as at any other point, and allow sewage to penetrate for a distance equivalent to the thickness of the pipe into the joint, if not filled with cement. Moreover, if oakum is packed between spigot and bell, the sewage goes still further by soaking it and finally causing its decay, so that very little space is left for the leak to be checked by the outside pointing. In fact, we prefer a joint packed full of cement inside and outside and well wiped. It is then tight beyond a doubt for all time.

*By Cady Staley, President of the Case School of Applied Science, Cleveland, O., and George S. Pierson, C. E., New York. D. Van Nostrand, 1886.

For Contracting and Building Intelligence, see Supplement.

NOTES.

CONFERENCE ON STANDARD PIPE-THREADS.

A JOINT meeting with representation from the wrought-iron manufacturers, the iron fitting manufacturers, and the brass goods manufacturers, and the Committee on Standard Pipe-Threads of the American Society of Mechanical Engineers, met at the Fifth Avenue Hotel, this city, on 25th inst., to discuss the question of the adoption of some common standard for threads for pipe and fittings. The matter is to be further dealt with at the meeting to be held in Pittsburg, November 8. When the pipe-makers agree on a standard, the other interests express a willingness to adopt it.

"American Art" is the title of a new monthly magazine of which we have received the first number. It proposes in prospectus to deal with "paintings, sculpture, architecture, archaeology, metal-work, ceramics, interior decorations, and other kindred subjects by the leading writers of this country, and illustrated by the best artists. It is published by the American Art Magazine Co., Studio Building, Tremont Street, Boston, at \$2.50 per year.

THE American Street Railway Association held its fourth annual meeting in Cincinnati beginning October 20.

RAILROAD EXTENSIONS.—The Brunswick and Western Railroad, Georgia, will build, it is said, from Brunswick to Columbus. The Columbus Board of Trade will give \$100,000 to the work. The Vice-President of the road is A. A. Gaddis, Brunswick, Geo.

Address W. J. McClure, or Messrs. J. G. Truitt & Co., all of La Grange, Geo., about a projected railroad.

Augusta, Geo., is moving to build a road through Georgia to Chattanooga.

Eaton, Geo., has raised \$30,000 to build a road to Monticello.

Milledgeville, Geo., is taking steps to build a road to some point on the Covington and Macon.

The Atlanta and Hawkinsville R. R., Geo., is assured, and it is probable that work on it will be begun very soon.

Columbus, Geo., is preparing to build a road to Florida. A prospectus has been issued, and subscriptions to the stock are being taken.

PITTSBURG, PA.—The contract for the foundation of the new Exposition Building has been awarded to Kunkle & Jordan for \$55,380. The work is to be completed by May 15.

YORK, PA.—At a public meeting held in the Board of Trade rooms on the 18th inst., \$16,000 was subscribed toward a capital stock of \$100,000 for building a hotel.

THE New York Real Estate and Building Improvement Co. has just been incorporated with a capital stock of \$100,000, its purpose being to buy and improve real estate. Among the incorporators are: Wallace C. Andrews, George E. Harney, Ferdinand Fish, Fred. M. Littlefield, George W. Lithgow, Thomas Dimond, and Joseph C. Davis.

ST. PAUL, MINN.—City Engineer Rundlett reports to the City Council that 8.04 miles of street-paving should be done next season. For the past year he gives the cost of different items of paving as follows: Cedar block, per square yard, \$1.25; granite curb, per lineal foot, 90 cents; earth excavation, per cubic yard, 20 to 25 cents; cost of paving, per lineal foot of street for 40-foot roadway, \$8.

MILWAUKEE.—The subject of a new library and public museum is being agitated. The library trustees held a meeting October 12 and decided that the matter must be pushed, and a committee of six were appointed to present a plan of action and to procure legislation necessary for the erection of a building. Committee: G. J. Obermann, C. Preusser, A. Meinecke, W. Plankinton, W. E. Anderson, and Julius Goldschmidt.

BROOKLYN, N. Y.—A corporation entitled the Shreveport Water-Works Company have filed a certificate with the Secretary of State at Albany. Its place of business is to be in this city. The trustees are Charles M. Berrian, of Brooklyn, and Howard D. Hills, Josiah Bertine, and Charles B. Graham, of New York City, and Emil Woltman, of Plainfield, N. J.

NEW YORK AND NEW ENGLAND R. R.—Associated Press dispatches of October 24 say: Engineers have begun surveying for a new road from Hopewell Junction, on the line of the New York and New England Railroad, to Lake Mahopac. The construction of the road will necessitate the digging of a tunnel 2,000 feet long through the mountain near Hartentown. L. B. Bidwell, Chief Engineer of the road, is at the office in Boston.

THE Duluth, Southshore, and Atlantic R. R. has bought the Detroit, Mackinaw, and Marquette R. R., and will develop a new route to Sault Ste. Marie. The contract for construction of new road between Duluth and the Sault has been given to Brown, Howard & Co., one of the contractors on the new Croton aqueduct, office at No. 20 Nassau Street, this city.

ANNOUNCEMENT.

The publication of the sixth revised edition of the U. S. Pharmacopoeia (1880), containing as it does much more strict requirements for the purity and strength of pharmaceutical preparations, has been followed in some States of the Union by the enactment of laws against the adulteration of drugs, which laws make the Pharmacopoeia the official standard.

In accordance with our established policy we shall, as in the past, use our best endeavors to furnish only such preparations as shall meet pharmacopoeial requirements. We are heartily in sympathy with all efforts which aim to improve the quality of medicines, and shall continue as heretofore to exclude all low grade and inferior articles and to use our influence to promote the sale and use of pure drugs and medical preparations.

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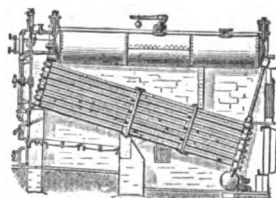
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Proposals.

(Continued from page 514)

U. S. ENGINEER OFFICE,
WILMINGTON, N. C., October 20, 1886.
Proposals for furnishing 20,000 tons of Stone for the improvement of the Cape Fear River, North Carolina, will be received until noon of November 9, 1886, and opened immediately thereafter. Blank forms, specifications and information can be had upon application to this office.

W. H. BIXBY,
Captain of Engineers, U. S. A.

U. S. ENGINEER OFFICE,
WILMINGTON, N. C., October 20, 1886.
Proposals for dredging in Georgetown Harbor, South Carolina, will be received at this office until half-past Eleven o'clock A. M., November 9, 1886, and opened immediately thereafter. Blank forms, specifications and information can be had upon application to this office.

W. H. BIXBY,
Captain of Engineers, U. S. A.

U. S. ENGINEER OFFICE,
WILMINGTON, N. C., October 20, 1886.
Proposals for dredging in Cape Fear River, North Carolina, will be received until Eleven o'clock A. M., November 9, 1886, and opened immediately thereafter. Blank forms, specifications and information can be had upon application to this office.

W. H. BIXBY,
Captain of Engineers, U. S. A.

U. S. ENGINEER OFFICE,
WILMINGTON, N. C., October 20, 1886.
Proposals for dredging in Mosquito Creek, South Carolina, will be received until noon, November 20, 1886, and opened immediately thereafter. Blank forms, specifications and information can be had upon application to this office.

W. H. BIXBY,
Captain of Engineers, U. S. A.

PROPOSALS FOR CONSTRUCTION OF BUILDINGS AT FORT PORTER, N. Y.

OFFICE OF CHIEF QUARTERMASTER,
DIVISION OF THE ATLANTIC,
GOVERNOR'S ISLAND, N. Y. H., October 22, 1886.

Sealed proposals, in triplicate, subject to usual conditions, will be received at this office and at the office of the Post Quartermaster, Fort Porter, Buffalo, N. Y., until 12 o'clock M., Eastern time, November 22, 1886, at which time and places they will be opened in the presence of attending bidders for the construction at Fort Porter, N. Y., of an Administration Building, two sets of Company Barracks, and a Guard House, all of brick, in accordance with plans and specifications which can be seen at the offices mentioned above, where blanks for proposals, and information as to the manner of bidding, etc., can be obtained.

Envelopes containing proposals should be marked "Proposals for Construction of Buildings at Fort Porter, N. Y."

The Government reserves the right to reject any or all bids.

CHAS. H. TOMPKINS,
Assistant Quartermaster General, U. S. Army.

Proposals.

PROPOSALS FOR DREDGING.

U. S. ENGINEER OFFICE,
NORFOLK, VA., October 12, 1886.
Proposals will be received at this office until noon of November 11, 1886, and then publicly opened, for dredging to improve the Southern Branch of Norfolk Harbor, Va., and the approach to said harbor between Lambert's Point and Fort Norfolk. The amount available for this work is about \$70,000, including the expense of superintendence, etc., etc.; \$25,000 thereof will be spent on the approach. For specifications, blanks for proposals, and all information apply to the undersigned at this office.

F. A. HINMAN,
Captain of Engineers, U. S. A.

DEPT QUARTERMASTER'S OFFICE,
DAVIDS ISLAND, N. Y. H., October 2, 1886.

Sealed proposals, in triplicate, subject to the usual conditions, are invited and will be received at this office until Tuesday, November 2, 1886, 12 o'clock, at which time and place they will be opened in presence of attending bidders for furnishing and delivering, free of expense, for cartage or packages, the Quartermaster's Stores specified on schedule at this office. A preference will be given to articles of domestic production and manufacture, conditions of price and quality being equal, and such preference given to articles of American production and manufacture produced on the Pacific Coast to the extent of the consumption required by the public service there. The right to reject any or all bids or parts thereof is reserved by the Government. Envelopes containing proposals should be marked "Proposals for Quartermaster's Stores, November 2, 1886," and addressed to the undersigned. Blank forms, etc., furnished on application.

GEO. H. COOK,
Capt. & Asst. Quartermaster, U. S. Army.

DREDGING in Wilmington Harbor, Del. Until November 5. Address William F. Smith, U. S. Agent, 1112 King Street, Wilmington, Del.

DREDGING in Susquehanna River, Md. Until November 1. Address William F. Smith, U. S. Agent, 1112 King Street, Wilmington, Del.

COLT'S REVOLVERS, (calibre 45) and spare parts. Until November 4. Address General S. V. Benet, Chief of Ordnance, War Department, Washington, D. C.

LIGHT-HOUSE SUPPLIES. Until November 9. Address Commodore A. E. K. Benham, U. S. N., Light-House Inspector, Tompkinsville, N. Y.

ENGINEERS' SUPPLIES. Until November 4. Address Charles H. Loring, Engineer in Chief, U. S. N., Bureau of Steam Engineering, Washington, D. C.

REMOVING pier, and building new pier at foot of West Fortieth Street, New York City. Until November 4. Address Department of Docks, Pier A, North River.

HOT SPRINGS RESERVATION IMPROVEMENTS, Hot Springs, Ark. Until November 16. Address L. Q. C. Lamar, Secretary of the Interior, Washington, D. C.

GRADING AND PAVING Quincy Street, Brooklyn, with cobble-stone pavement. Until November 9. Address George Ricard Connor, Commissioner of the Department of City Works.

PROPOSALS for water-works. Until November 8. Address City Clerk, Minneapolis, Kansas.

SEALED proposals will be received until noon, November 2, for materials and labor on following additions to the Asylum for the Insane, near Toledo, Ohio: Covered way, bath-house, employees' and fire department quarters, barn and stable, ice-house, physicians' residence. The estimated cost is \$33,745-75.

BUILDING shore extension on the St. John's River, Fla. Until November 9. Address W. M. Black, First Lieut. of Engineers, U. S. A., Jacksonville, Fla.

BUILDING asylum at Toledo, Ohio. Until November 2. Address J. W. Nelson, Room 18, St. Clair Building, Toledo, Ohio.

IRON WORK at the Kansas State Capital. Until November 3. Address George Ropes, architect, No. 201 Kansas Avenue, Topeka, Kan.

DREDGING in Ogdensburg Harbor. Until November 11. Address M. B. Adams, Major of Engineers, Burlington, Vt.

PROPOSALS for materials and erection of a keeper's dwelling at Key West Light Station will be received by Major W. H. Heuer, U. S. Engineer, 7th Light House District, New Orleans. Until 12 o'clock, November 6.

PILE AND JETTY WORK at Volusia Bar, Fla. Until November 9. Address Lieutenant W. M. Black, U. S. Engineers, Jacksonville, Fla.

BUILDING 300 feet of Jetty. Until November 9. Address Lieut. W. M. Black, U. S. Engineers, Jacksonville, Fla.

IRON BRIDGE across Chariton River near Lewis' Mill, Chariton Co., Missouri. Until November 3. Address John A. Lee, Clerk of County Court, Keytesville, Mo.

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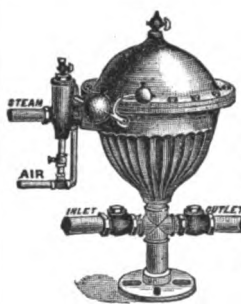
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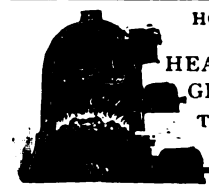
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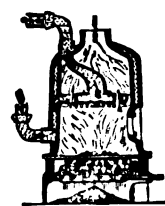
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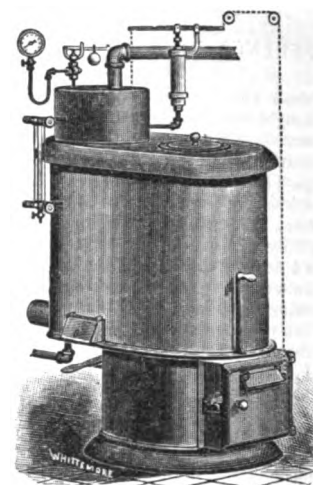
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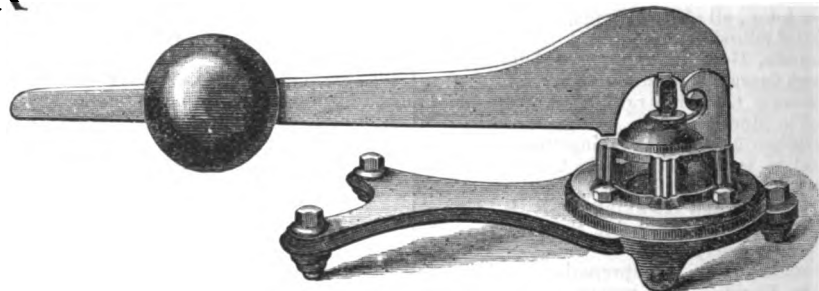
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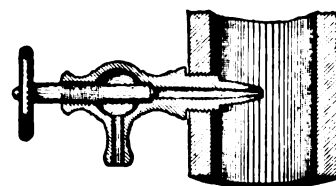
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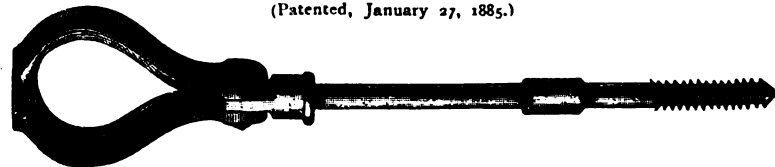
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ANNOUNCEMENT.

THE SANITARY ENGINEER & CONSTRUCTION RECORD is now the title of this journal. The words "Construction Record" have been adopted with a view to conveying to those not generally acquainted with the character of its contents the scope of the subjects treated, which include those properly belonging to a weekly journal devoted to engineering, architecture, construction, and sanitation.

Our exchanges in quoting from us will confer a favor by crediting us with our full title.

THE RIO CATASTROPHE.

IN the recent terrible railroad accident at Rio, Wis., almost every person in one railway-car was mangled or roasted to death by the taking fire of the wreck from either a coal-stove or the kerosene-oil lamps.

When railroad accidents happen during cold weather when the stoves are in use, or at night when the lamps are lighted, the train generally takes fire, with the result of adding to the horror and increasing the destruction to life in an enormous degree. When crowded cars are derailed and smashed only, the percentage of deaths is comparatively low—ten per cent. of all in a car being a large death-rate; but when an overturned car takes fire, the stunned, fainting, and frightened people are roasted alive long before assistance can be rendered.

That there is no necessity for this wholesale murder and cremation cannot be controverted, and that it is within the power of railroad management to provide means of warming and lighting trains that will be reasonably safe in the matter of fire is also a well-established fact known to the men who should hold the care of the life and the limb of their passengers paramount to all other considerations.

THE SANITARY ENGINEER has on several occasions described and illustrated means for warming cars by steam or hot water from a central source. There is no serious difficulty in taking steam from a locomotive-boiler and passing it through cars to warm them. Railroad managers object to this, because in cold weather they say they have "little enough steam to put the train on time." This is not a difficulty that is insurmountable. A small boiler in a corner of a baggage-car will overcome all this; or cars can be warmed from a terminal station by storage-heaters, several of which are before the public. That the warming of cars by steam or by storage-heaters is more than an experiment has been demonstrated by the elevated railroads of New York, and was strongly advised by Col. Hain for the Brooklyn elevated roads and Bridge cars. In the case of the New York elevated roads they take steam from the locomotive when it can be spared, on down grades, etc., and warm the storage-heaters thereby, two or three minutes of steam admission being enough to warm the storage-heaters for twenty minutes or half an hour. But the kerosene-oil lamps should at once be prohibited by law, as also the heating of cars by stoves within them.

A few roads have abandoned the lamps, but the great majority of cars, and including the most expensive and elegant ones, are yet lighted by mineral oil. In a smash-up the copper bodies

of the lamps are fractured and the oil is distributed over wood-work and passengers. It is this that facilitates the burning of a train from end to end, and prevents strong and uninjured men and women from escaping. Gas in a train is far safer than oil, but incandescent electric-lighting is safer and better than either. The auxiliary boiler which runs the steam or hot-water plant for the warming of a train can also run the dynamo, and to prevent a car from being left in darkness, by accident or design, a few sperm candles in holders, such as were formerly used, can be introduced. It is the duty of our legislators, and of all who travel by train, to make it imperative on railroad managers to abandon the coal-stove and all inflammable oils in railway-carriages, and until such a law is on the statute books of each State, just so long will we hear of such holocausts as has happened at Rio, and so long also will the merchant and business man when he lies down in a sleeping-car take the risk of being roasted in his blankets.

STRENGTH OF THE ELEVATED ROADS.

We are glad to see from Manager Hain, of the Manhattan Railway Company, so emphatic a statement respecting the safety of the New York elevated railway structures as that published in the *Sun* on the 18th inst. and reprinted elsewhere. We are also glad to welcome so powerful an ally as the *Sun* in the good work of urging forward the speedy construction of one or more underground railroads, though we prefer a viaduct. The time has come when they may be undertaken with every prospect of their being financially successful, since there is every reason to suppose that by the time they can be built the present means of transit will be entirely inadequate for the traffic.

The uniform history of every line running north and south in the city has been a moderate traffic at first, which has rapidly developed until new lines have had to be built. When a committee of the American Society of Civil Engineers had the matter of rapid transit under discussion, they, after a very full survey of the whole field, reached the conclusion that the only chance of getting a road built at all was to make it for the lightest locomotives and the lightest cars that could be safely run and do the business then anticipated, thus requiring the least practicable weight of metal in the structure itself. So rapidly did the business increase, however, after the road was in operation, that very soon heavier locomotives were obtained, and a process of strengthening begun, which has been continued to the present time. Of course, this cannot go on indefinitely, since it will be difficult to strengthen the joints of pin-connections, etc., without a virtual renewal of the structures. These structures being in short spans, and by comparison light, it is the part of prudence also to use a higher factor of safety than would be required in longer spans and under less severe usage, and this is always done in the best engineering practice.

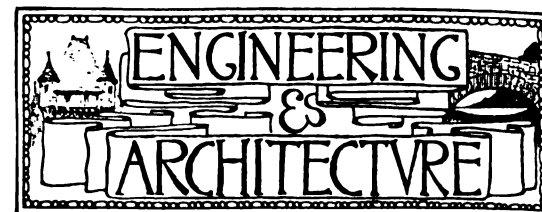
This, however, can be safely trusted to the energetic manager whose services the elevated railways are so fortunate in possessing. Meanwhile property owners should not blindly oppose further rapid transit facilities, though private rights if encroached on for a public benefit should certainly be adequately taken care of.

THE Law Department of the New York Board of Health is to be congratulated on securing two convictions and the punishment of offenders within the past week. In one case a plumber by the name of James Harmon was convicted for putting in dummy vent-pipes in a new building in Grand Street, and was sentenced by the Court of Special Sessions to two months' imprisonment. This is the first case where the penalty imposed for violation of the plumbing law has been more than a fine. It is therefore valuable as a precedent as well as a deterrent. A builder was also fined by the same court \$250 for constructing tenement-houses in violation of the tenement-house law. The vigorous prosecution of offenders of this class is a gratifying evidence of the efficiency of the department of the Health Board which has special charge of matters of light, ventilation, plumbing, and drainage.

with only about a third of its circumference exposed, the other two-thirds warming the floor and wood-work of the boat in the angle in which it is placed, and heating such pipe with steam. The company's instruction to their engineers is to burn as little coal as possible. That being the case, the engineers, in self-protection and to show a small expenditure of coal, starve the steam-supply for the heating of the pipes, causing, of course, discomfort to the passengers.

I referred in my letter of 4th ult., in connection with the Sunderland School's scheme, to the necessity of combination among architects in order that a set of regulations might be laid down governing the conduct of competitions. The relations between architects and municipal authorities are continually being strained in connection with such matters. The latest instance is reported from Carlisle. In connection with the Carlisle Market's competition a number of the competitors stipulated for a professional assessor, a demand the corporation will not concede.

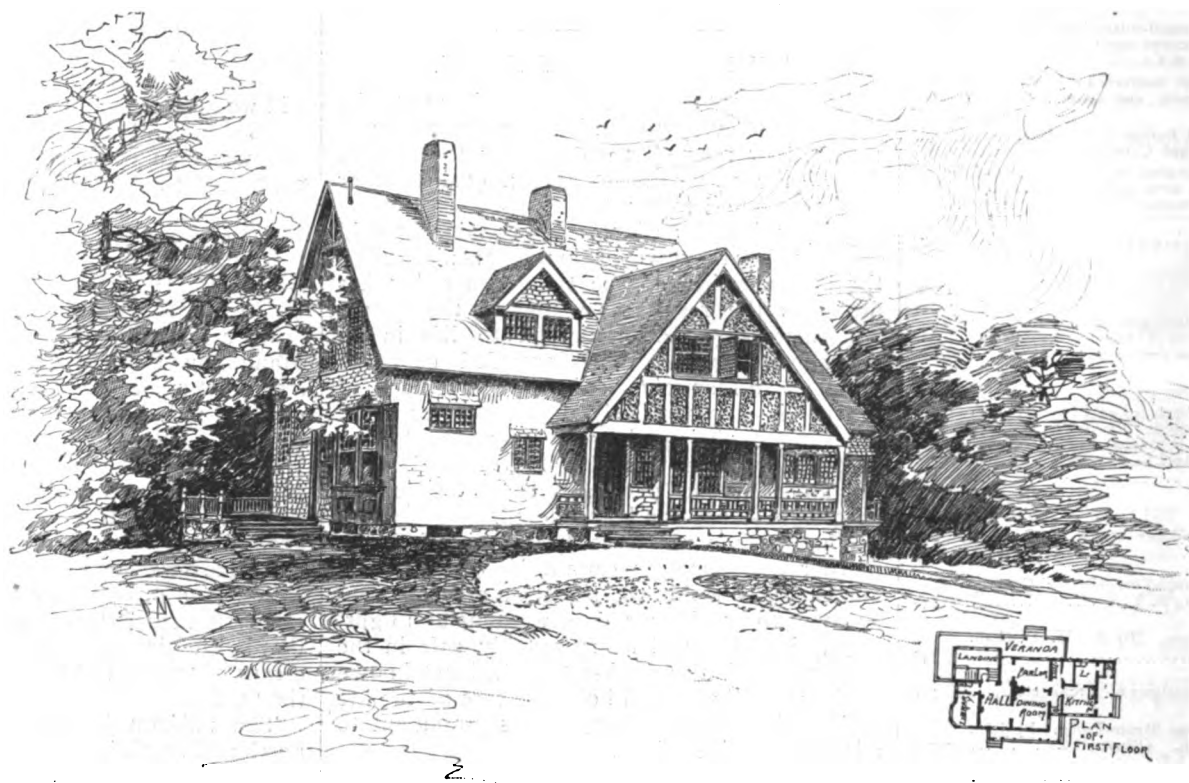
An artesian well-boring at Buda-Pesth, in Hungary, of a depth of 3,500 feet, has resulted in a hot-water supply from a natural spring, of about 150,000 gallons per diem, the temperature thirty-five feet above the ground being 70° C. (158° Fah.). The municipal authorities have subscribed £200,000 toward the undertaking. It is expected



OUR SPECIAL ILLUSTRATION.

RESIDENCE OF DR. F. C. SHATTUCK.—CABOT & CHANDLER, ARCHITECTS.

THE subject of our special illustration this week is the residence of Dr. F. C. Shattuck, on Marlboro Street, Boston. The front is of Philadelphia face brick, brown-stone trimmings, with carved brick decoration. The cost was \$40,000. The architects were Messrs. Cabot & Chandler, of Boston.



RESIDENCE OF DR. MORRIS H. HENRY, TUXEDO PARK, N. Y.—BRUCE PRICE, ARCHITECT.

OUR BRITISH CORRESPONDENCE.

A Bolton Judge on Making Mortar from Garbage Clinker—Heating the Thames Steamboats—Sunderland School-House Competition—Hot-Water Artesian Well at Buda-Pesth—Tests of Sugar as an Anti-Incrustator for Steam-Boilers.

LONDON, October 16, 1886.

THE local County Court Judge at Bolton (Lanes) apparently denies the right of municipal corporations to engage in manufacturing enterprises. In a case where the corporation of that town sued a man for account due for mortar manufactured in their sanitary department, the judge said the corporation had no business to engage in a trade of that kind. Seeing that the residue from the furnaces of garbage destructors is particularly adapted after grinding for mortar-making, it is not clear where the wrong comes in.

The ideas of the River Thames Steamboat Company with regard to the comfort of passengers and the means of heating their boats for the winter months are, to say the least of it, crude. In three boats that have recently been built they run a 2-inch pipe round the saloon at the floor-level,

that the temperature will reach 80° C. (176° Fah.), and that the supply of hot water will be sufficient for the whole town.

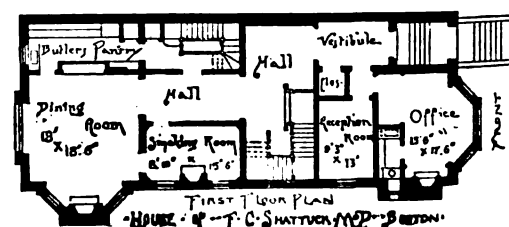
Colonel Agostino Polto, an Italian engineer, reports the result of experiments made with the view of ascertaining the detergent properties of sugar as an anti-incrustation fluid for boilers. The sugar used was one known as Muscovado, a kind of raw sugar, rich in saccharine matter. The boiler used for the experiments was a 20-horse-power tubular boiler, with 126 tubes. Its ordinary working life was 380 hours, after which the scale removed averaged twelve kilograms. For the purpose of a test, one-third of the tubes was left uncleansed, the boiler was filled, and two kilograms of sugar put in the water; at intervals of seven days during the working, one and two kilograms further were alternately added. At the expiration of forty-five days, it is stated that the boiler could be easily cleansed without scraping; that the tubes which had been left uncleansed were cleaner than they were at the time of starting the experiment, and that about eight kilograms of old scale from the uncleansed tubes had been precipitated to the bottom of the boiler. After a further trial, the effect of the solution on the uncleansed tubes was still more satisfactory, as they were still further free from scale. At the same time the remaining tubes were clean and bright, requiring only an injection of clean water to cleanse them satisfactorily.

SAFETY-VALVE.

OUR ILLUSTRATION OF A MODERATE-COST HOUSE.

COUNTRY RESIDENCE AT TUXEDO PARK, N. Y.—BRUCE PRICE, ARCHITECT.

THE subject of our vignette illustration this week is the country residence of Dr. Morris H. Henry in Tuxedo Park, N. Y. The frame is hemlock, pine trim, with cedar shingles. The interior finish is white wood stained and filled to imitate old oak. Halls and principal rooms panel wainscot, open-rafter ceiling to stair-hall. Gables plastered and studded with quartz chips. Color of building a gray-green stained. The cost was \$10,000. The architect was Mr. Bruce Price, of New York.





THE SANITARY ENGINEER ILLUSTRATED SERIES.

A RESIDENCE AT BOSTON, MASS.

CABOT & CHANDLER, ARCHITECTS.

THE PALACE OF THE TROCADERO.

PROBABLY very few modern buildings have received so much criticism, favorable as well as unfavorable, as the huge structure, half exhibition hall, half museum, known as the Palais du Trocadero. It is familiar to every one who has visited Paris during the past eight years as one of the most markedly individual pieces of architecture the modern French school has produced. To the American student of architecture it has interest in more ways than one, for whatever may be said of the quality of its design, the practical fitness of the plan has been fully proven by the experience of eight years, and at the same time the internal construction and arrangement offer many valuable suggestions to one who would go below the surface of things and find out how and why architectural ideas are expressed in masonry and iron. Indeed, the Palais du Trocadero may be considered as an epitome of French building construction. We in America, somehow, give the French credit for very little practical ability in the lines of construction, as such, and usually think of them only as artists—which they undoubtedly are—but the Parisians, as a rule, are as thorough in their construction as in their art, and their buildings are built to last a century, without waste of material.

The history of the erection of the Trocadero shows a constant succession of difficulties not only met and overcome, but even turned to good account in the final arrangement. When the site was fixed on the high hill facing the Champ de Mars, the body of the building was found to be located directly over extensive quarries, long since abandoned, the hill being cut through and through with lines of tunnels. Under the left wing good bottom was found, but under the right the ground was all of a loose rubbish filling. Over such uneven ground the heavy masonry building was erected. The foundations of the left wing were carried down some fifteen metres to solid rock-bearings, and about the central portion over the quarries the foundations were worked from both directions; that is to say, the ground was cleared of earth down to the rock immediately over the caverns and the piers started on a level footing, while underneath in the galleries corresponding piers were being built, so that finally solid foundations extended clear down to the floor of the quarries.

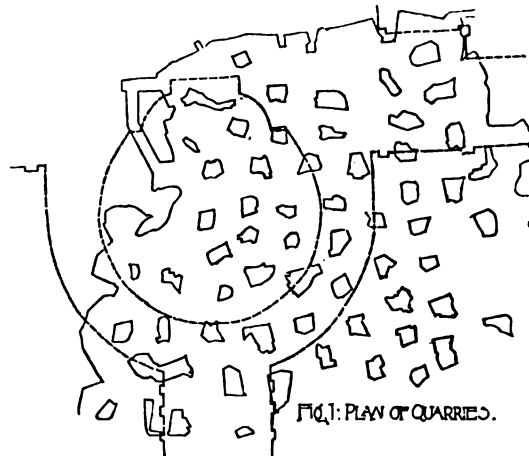
The foundations, as well as nearly all of the main walls, were built up in heavy rubble-work, a porous limestone being used, as full of great holes as a sponge, but very hard, and from its open shape allowing the mortar to clinch about each piece as firmly as though the wall were one entire piece of concrete. Mortar made with Boulogne Portland cement was used exclusively. It is of value to note the care that was taken in the mixing of this cement mortar, to have the strength proportionate to the load the masonry would have to bear. A scale of proportions was adopted, and the architect claims it was rigidly adhered to. There was mixed with every cubic metre of sand, for masonry sustaining a load of 4 kilos per square centimetre, 200 kilos of cement; for loads of 10 kilos, 300 kilos; for loads of 15 kilos, 400 kilos; and for loads of 18 kilos, 500 kilos—or, in other terms, the mortar for ordinary foundation-walls contained about 600 pounds of cement per cubic yard of sand, while under the walls of the great hall the quantity of cement was 800 pounds, and for the towers 1,000 pounds, the quantities of cement being proportionally diminished as the wall rose in height. There are no records of any tests having been made to determine how much actual gain in strength accompanied the increase in the quantity of cement. The mean proportion is nearest that generally in use on good American work.

The difficulties of building on such a site will perhaps be better appreciated by reference to Fig. 1, which is a plan of the old quarried galleries, with the position of the building above indicated by the heavy dotted lines. On the right the conditions were even worse, as already stated, while on the left no difficulties at all were encountered; but in spite of such inequality and of the consequent extreme variation in the depth of the foundations, the building has stood perfectly and has never shown a crack or a settlement of any kind. This is the more remarkable as the palace was erected and entirely finished in eighteen months, involving an outlay of 20,000 to 30,000 francs per day, and a total cost of nearly two million dollars.

In plan the palace consists of a huge audience hall at the centre, surrounded by double arcades and flanked by two tall towers. At each side are long wings stretching out in a semi-ellipse over the side of the hill and terminating toward the river in square pavilions. Aside from the

foundations there is little worthy of notice about the wings. They are used as exhibition rooms for permanent collections, and as such serve their purpose admirably, but have nothing to offer of practical interest. With the central hall, however, it is quite different, and a number of problems presented themselves to the architect at the very start. It was to be a single concert hall or auditorium to seat 5,000 persons, and the acoustic properties must be perfect. To secure this result a number of studies were made, which while they did not lead to the absolute perfection hoped for, were still as thoughtfully worked out and applied that any acoustic defect in the hall can hardly be charged against the architects. It seems worth while to reproduce here a synopsis of the manner in which such intangible and unsettled things as acoustic properties were studied and investigated for a particular case.

Sound travels at the rate of 1,100 feet per second in all directions from a given focus. If an obstacle is interposed to the sound wave, the sound will act in one of two manners according to the nature of the interposed obstacle, being absorbed if it encounters something very flexible or soft, such as cloth, or reflected in the same manner as a ray of light if the obstacle is hard or polished, like wood or marble. If the reflecting surface is very near the focus the direct and the reflected rays of sound arrive at the ear of the spectator at nearly the same time, and the sound will be enforced. If the reflecting surface is a short distance from the focus there will be a resonance; and if it is far from the source of sound a distinct echo is produced. The first condition is always desirable, the second is sometimes an advantage, but an echo is always to be avoided.



Science has demonstrated that the human ear is susceptible of distinguishing successive sounds only when they are separated by an interval of more than a tenth part of a second. Hence it follows that echo is distinguishable only when the reflected ray of sound reaches the ear one-tenth of a second or more after the direct sound, and it can be assumed that 110 feet is the extreme difference which must exist in a hall between the lengths of the paths of the direct and the reflected sound. As 110 feet includes the going and the return of the sound ray, we may conclude that no sound-reflecting surface should exist at a distance of over fifty-five feet from the focus. In the Grande Salle of the Trocadero, which measures fifty metres in diameter, this condition is brought about as follows: All wall and ceiling surfaces more than fifty-five feet distant from the conductor's stand of the orchestra were covered with canvas intended to absorb the sound rays and so prevent any echo, while the surfaces nearer than fifty-five feet were of hard stucco applied over solid masonry. The hall was so large that this latter treatment was confined to the wide arched space over and about the stage, which is semi-elliptical in plan and covered by an irregularly curved surface whose exact shape was determined by a graphical analysis of the course the sound waves would theoretically follow. To make such an analysis the surface was divided into a hundred spaces and the auditorium into a corresponding number of divisions. A line was drawn from the focus of one division of the vault, another line from there to the corresponding portion of the hall, and the surface of the vault was made normal to a line bisecting the angle formed by the two lines. By logically following out this method a surface was developed which not only caught all the sounds within a distance of fifty-five feet to the sides and back and reflected them into the auditorium, but also reflected them in such a manner that they went only to the seats, and that the seats farthest removed from the focus received a greater proportion of the reflection and conse-

quent strengthening than those near by, making it possible to hear as distinctly at a distance of 150 feet from the orchestra as in the first row of the parquet. Not content with all these geometrical calculations, the architects went a step farther and built a small model of the hall, with a polished silver surface to serve as the reflecting vault. On placing an electric-light at the focus it was seen that the rays of light, which would act exactly as the sound waves, were reflected upon all the seats of the auditorium, though not beyond them or upon the walls.

But after all these precautions the hall is not entirely perfect. In a portion of the parquet there is a very slight echo, the cause of which is not difficult to explain. It was stated that the walls of the hall were covered with canvas, but instead of being loosely applied like tapestries, it was pasted tightly to the solid masonry, so that it formed a rough, hard surface. It is now the intention to take off this canvas covering and loosely fit another over light open frames, when the echo will probably cease.

Another problem successfully solved was the heating and ventilating. There is nothing of special note about the appliances or arrangements for this purpose, the air entering at the top and being drawn out through ducts opening in the back of each seat; but it is interesting to notice the way in which the old quarries are used to heat the hall in winter and to cool it in summer. The entire air-supply is drawn from the subterranean passages, which have been thoroughly cleansed and built about. No matter what the outside temperature may be the air in passing through the quarries acquires the temperature of the earth, about 55°. On a hot day this is sufficient to keep the hall delightfully cool, while in winter a slight amount of added artificial heat suffices for all purposes, and practically, though full steam appliances are provided, they have never been used since the first trial day.

The Grand Salle is covered by a truncated conical roof of fifty metres clear span and about twenty metres rise. The frame-work is formed by twelve plate girders, four of which are continuous across the centre while the others butt against a heavy annular girder which directly supports the weight of a large lantern. The roof-girders are single-webbed wrought-iron beams, with $\frac{3}{8}$ x 40-inch web, 4 x 4 x $\frac{1}{2}$ -inch angle-irons, and $\frac{3}{8}$ x 16-inch top and bottom plates. The girders are braced and tied together by three rows of cross-girders extended around the roof and effectually counteracting any thrust. The roof-beams are of wood and the lead roofing is laid over ordinary boarding. This is the only portion of the building which has anything like wooden construction.

The domed ceiling which immediately covers the hall is probably the lightest piece of construction in existence, being less than three-quarters of an inch thick. It consists of a light iron frame-work hung by rods from the roof-girders and dividing the surface into panels about four feet square which are filled with thin plaster slabs cast with a quantity of loose hemp mixed in the plaster, the panels being further strengthened by diagonal iron rods. The inner surface of the dome is covered with canvas in the same manner as the walls below.

The architects of the palace were Messieurs Davioud & Bourdais.
C. H. BLACKALL.

CONVENTION OF THE AMERICAN INSTITUTE OF ARCHITECTS.

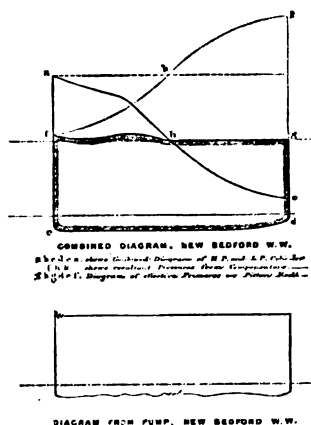
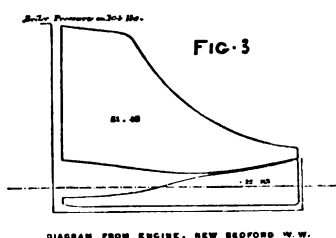
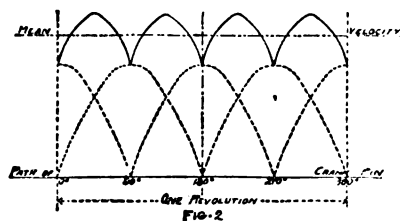
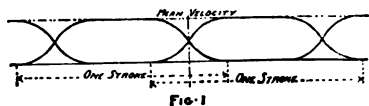
SIR: The twentieth annual convention of the American Institute of Architects will be held in the city of New York, on the 1st, 2d, and 3d of December. Messrs. F. T. Littell, A. J. Bloor, and O. P. Hatfield have been appointed a committee on arrangements. A detailed notice of arrangements and the programme for the convention will be sent out later. The committee, in view of the limited time at its disposal, requests all those who desire to attend the meetings of the convention to notify the Secretary, Mr. George C. Mason, 10 Catharine Street, Newport, R. I., of their intention to be present. The committee further desires to obtain papers on subjects of interest to architects; also, suggestions of subjects for discussion, with drawings, sketches, and models for exhibition. All communications should be sent to the secretary as early as possible. It is also requested that all reports from officers, chapters, and standing committees be forwarded to the secretary before the meeting of the convention, thus avoiding delays and irregularities in the proceedings.
E. T. LITTELL, Chairman.

EXPERIMENTS ON A DIRECT-ACTING STEAM-PUMP.

BY JOHN GEORGE MAIR, M. INST. C. E.*

THIS test was made by the author, in 1885, in Brooklyn, N. Y., on a pump arranged for experimental purposes, and this account is taken from the author's description.

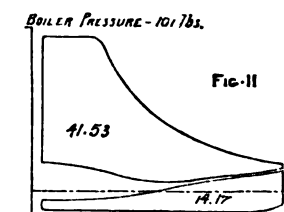
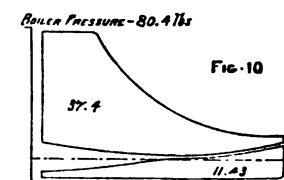
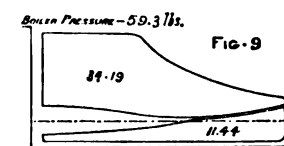
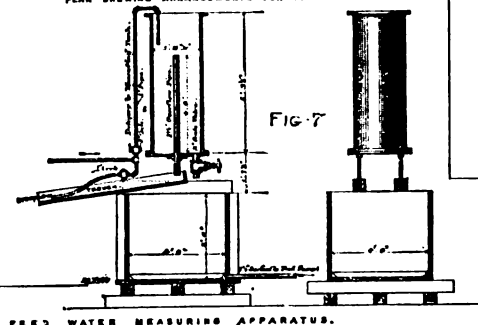
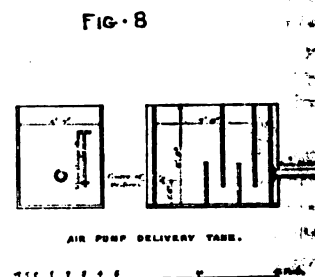
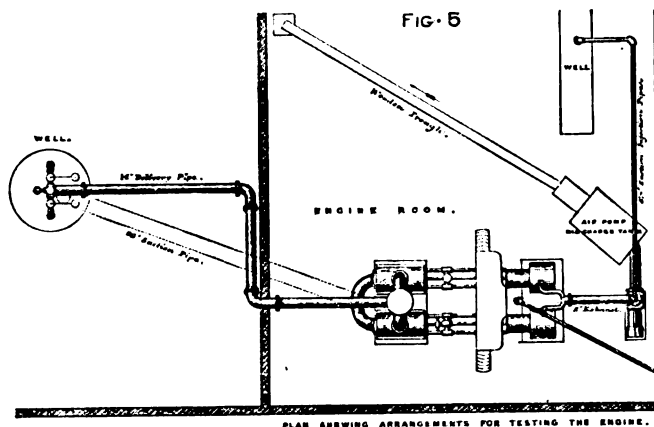
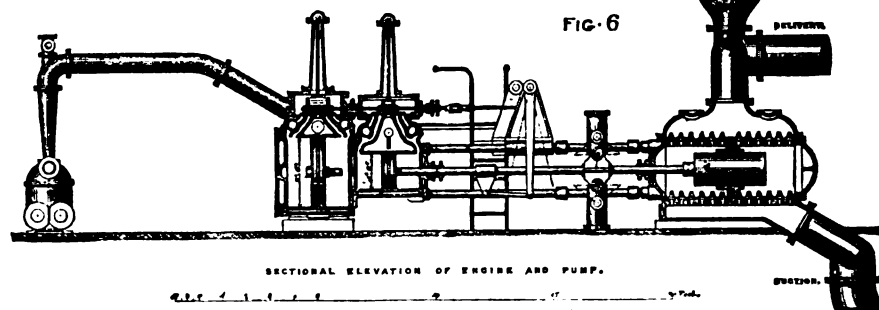
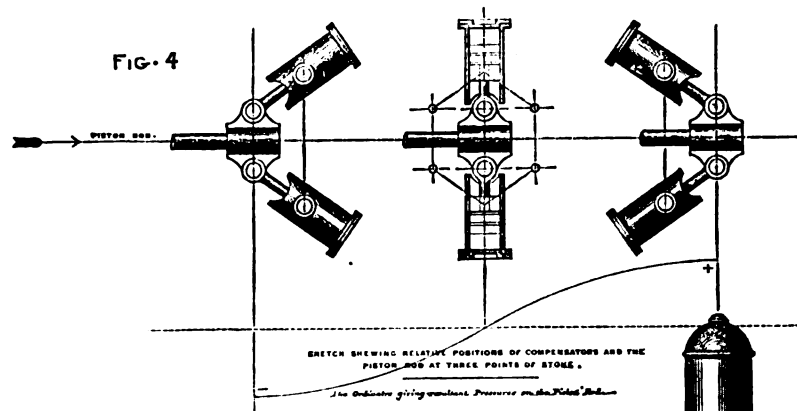
The water was pumped from a well and through weighted relief-valves back to the well, so that trials could be made which would have been impossible had the engine been performing the ordinary duty at a water-works. To pump about 1,700 gallons a minute through weighted and spring-valves is a more difficult service than pumping against a head of water in a main. It was, therefore, evident that whatever results were obtained on the trials, they could be readily repeated and improved upon in practice. The system consists of two independent engines and



pumps lying side by side, the motion of one engine actuating the valves of the other. The delivery of water from the pumps is almost absolutely uniform, and although an air-vessel is usually placed on the discharge-chamber, it is generally water-logged, and the author could not tell the difference in working either with or without air.

Figure 1 represents, approximately, the flow from the pump at each point of the stroke. As soon as one pump begins to slow down at the end of the stroke the other pump starts, so that by combining the flow it will be seen how uniform it is. On the contrary, the delivery from a compound rotative engine, with cranks at right angles, working two double-acting pumps, supposing the connecting rod to be indefinitely long, is shown by Fig. 2. The deliveries are added together and shown in full lines; the variation of flow in this case is sufficient to make the pressure fluctuate to such an extent that accidents are very liable to occur when working without air. The author, in his own practice, had met with many cases where accidents have happened to the pump-work and rising mains, when through carelessness no air was in the vessel, but with the uniform delivery of the type of twin pumps before described an air-vessel is not needed, and it is this uniform delivery that permits the use of the engine for pumping through oil-pipe lines where the friction in the mains amounts to 3,450 feet head at normal speed.

* Proceedings of the Institute of Civil Engineers, Vol. XXXVI., Part IV.



With the single or double acting pumps first used for this service, where the flow ceased at the end of the stroke, the pressure-gauge fluctuated hundreds of pounds on the square inch, with a corresponding result of broken pipes and pumps.

The oil-pipe lines are of different diameters and lengths, and, taking as an example one that came under the personal notice of the author—namely, six inches in diameter and about thirty miles long, through which two 10-inch double plunger-pumps were forcing oil, the main would contain, if filled with oil at a specific gravity of 0.87, over 750 tons, and as this weight may be considered as attached to the pump-piston, a very simple calculation will show what excessive pressures are set up when such a weight is moved at a variable velocity, and also as the pressure in the pump is nearly all due to friction in the main, which increases or decreases practically as the square of the speed of the flow in it, it can be seen that the only system of pumping capable of working with safety is that in which the delivery from the pump is uniform and regular at every part of the stroke.

The underlying idea in the design of the new Worthington pump is the attachment of a form of compensation to the engine, which should absorb the excess of steam-power at the steam end during the first part of the stroke and give it out during the last part of the stroke, when, owing to expansion, the steam-pressure falls below the water-pressure. If the steam-pressure diagrams of an expansive

compound engine are combined together, it will be found that there is an excess of pressure *ab* at the commencement of the stroke (Fig. 3) over the mean pressure decreasing to half-stroke, and after that point there is an increasing deficiency of pressure *bc*. This variation with a rota-

tive engine is taken up by the fly-wheel, but in the high-duty Worthington engine there are two small cylinders (by preference oscillating) which are attached to the piston-rod, containing water or air under pressure. Referring to Fig. 4 it will be readily seen that the excess of work $a b$ (Fig. 3), which is a maximum at the commencement of the stroke and decreases to nothing at half-stroke, is taken up by these small cylinders. Directly after half-stroke, when the steam-pressure is below the water-pressure, they give out work $k k$, which increases to the end of the stroke, so that if the work absorbed or given out in the compensators is combined with the steam diagrams, a perfectly steady pressure-line is obtained, and the engine makes its stroke at a uniform speed, so that a straight pump diagram is obtained. The diagrams, Fig. 3, were taken from a high-duty pumping-engine, working under ordinary service at New Bedford, Mass., the steam being expanded during the time it was taken some ten or twelve times.

Engine Trials.—These trials were all carried out in a similar manner to those before made by the author. Figure 5 gives the general arrangement, plan of the boiler, engine, and pump, together with the position and details of the measuring-tanks. The engine and pump are shown in Fig. 6. The feed-water was measured in a cast-iron pipe, Fig. 7, with an overflow-pipe in it, and its contents to the level of the pipe were weighed on tested scales many times over, the temperature being noted each time, so that the quantity of water in the pipe which was used as a feed measuring-tank may be relied on as accurate. From the pipe the water was run into a wooden tank, out of which it was taken by the feed-donkey and pumped into the boiler. Mr. C. C. Worthington placed one of his water-meters between the feed-pump and the boiler, and the meter readings agreed within $\frac{1}{4}$ per cent. with the measurements made by the author.

The boiler was of the Corliss type, vertical, five feet four inches diameter by fourteen feet high, with vertical tubes, and as the heat went direct from the fire through the tubes and so heated the steam above the water-level, the steam was slightly superheated. A thermometer was fixed in the steam-pipe in the engine-house, the readings of which are given in the tables. The steam-pipe went across a yard in the open air, but being well covered with non-conducting composition, and the steam being slightly superheated, condensation to any marked extent was prevented. The steam-jackets drained into a tank, which was carefully measured, and when full the condensed water was discharged into a drain, and the time noted. The working-steam, after leaving the engine, passed through the education-pipe to an independent air-pump and condenser worked by a separate engine. Both the feed-donkey and the air-pump engine were supplied with steam from a separate boiler, so that, in taking the efficiency of the engine into account, the work done by these pumps should be deducted. Their having a separate steam-supply did not, of course, affect the heat used by the main engine itself, but only the efficiency—that is, the relation of the indicated horsepower to the pump horse-power. The steam from the main-engine, after being condensed and passing through the air-pump, was delivered through a short length of pipe to the discharge-tank (Fig. 8), where it is gauged through a circular orifice three inches in diameter. The temperatures of injection and air-pump discharge were read, and the head measured every quarter of an hour. Eight new indicators, made by the American Steam-Gauge Company were on the steam-cylinders fixed close up to each head, and the diagrams were averaged by ordinates in New York, and checked by planimeters in England. Two counters were on the engine, which checked each other, and two tested water-pressure gauges were fixed on the delivery-main.

Five assistants were in the engine-room and four in the boiler-house. A ship's chronometer was used for the time, and every quarter of an hour throughout all the tests gongs were sounded, one in the engine-room and one in the boiler-house, so that all observations were taken at the same instant, and the author took personal observations all round every half hour, so that no error could have crept in. Such detailed care was, however, not necessary, as the rejected heat was measured, and that gives the best check on the boiler-supply. The stroke was kept the full length, touching the cylinder heads each time, and so regularly did the engine run that, for each trial, all observations were almost exact counterparts of each other. Independently of measuring the heat-supply, many interesting experiments were made, the engine was slowed down until it made one double stroke in a minute and a half. The pump had its

pressure suddenly released, to show the safety of the engine, and the air-vessel was filled with air, and was also water-logged, the compensators were put out of gear—in fact, every experiment was tried that was of value. The author made nine full trials, and the assistant, Mr. Henry Smith, M. Inst. C. E., made three more after the author had left New York. These trials were so regular that it is sufficient to give the details of three.

The absolute quantity of water delivered by the pumps could not be exactly ascertained, but even if the full displacement of the plunger was not made, it would not affect the results of the trials, as the pump horse-power was taken from the actual pressure in the delivery-main (as recorded by the gauges tested in England) against the area of the plunger, all connections and by-passes being carefully shut off and plugged before the trials. At the end of each stroke a pause is made, which allows the pump-valves to close before the return stroke, and so prevents slip through them.

The average efficiency on the three trials is 91.5 per cent., but from this has to be deducted the power it would require to work the air and feed pumps, and taking this at $3\frac{1}{2}$ per cent. would give a net result of 88 per cent. efficiency, or a higher value than is generally obtained by a crank and fly-wheel engine when the pump-valves are tight. This is what would be expected, as the pistons of the compensating cylinders and trunnions certainly produce less friction than the crank-shaft bearings, crank and cross-head pins, guide-bars, eccentric straps, etc., of a fly-wheel engine.

The piston-speed, as compared with the English practice, is very low, and naturally the repairs and renewals with these engines are of the most trivial character, even over long and extended periods of working. The foundations are simple, as the stresses are self-contained; in fact, the engine experimented with by the author was hardly on any foundation, and when doing 165 indicated horse-power, as it did on one of the trials, it was perfectly steady, and worked without noise or vibration.

The following is a summary of three trials—No 1 on December 24, No. 2 on December 19, and No. 3 on December 22, 1885 (Figs. 9, 10, 11):

No. of trial.....	1	2	3
Double strokes per minute.....	45.0	39.26	40.10
Boiler-pressure..... lbs.	59.3	80.4	101.0
Feed-water per minute (tank measurement)..... lbs.	34.12	30.33	36.26
Jacket drains per minute..... "	4.22	4.15	4.57
Temperature of steam.....	359°	376°	390°
Pressure on pump, including suction..... lbs.	78.5	80.5	97.0
Pressure in compensators..... "	162.5	195.0	250.5
Mean pressure in high-pressure cylinder..... "	34.19	37.40	41.53
Mean pressure in low-pressure cylinder..... "	11.44	11.43	14.17
Temperature of injection.....	57.18°	57.10°	57.30°
air-pump discharge.....	84.95°	81.06°	89.50°
Head over centres of orifice..... ft.	1.727	1.802	1.397
Air-pump discharge per minute..... lbs.	1,174.0	1,197.0	1,056.0
Injection water..... "	1,144.0	1,171.0	1,024.0

Heat passing through Engine per minute—			
T U from boiler, saturated steam through cylinders.....	35,132.0	30,919.0	37,553.0
T U from boiler, superheat in steam.....	853.0	772.0	906.0
T U from boiler, condensation in jackets.....	3,794.0	3,677.0	4,003.0
Total.....	39,779.0	35,368.0	42,462.0
Heat retained in condensed steam.....	1,585.0	1,283.0	1,822.0
" absorbed by injection-water.....	11,769.0	28,057.0	32,972.0
" indicated work.....	5,096.0	4,621.0	5,579.0
" radiation.....	440.0	440.0	440.0
Error.....	589.0	967.0	1,649.0
Total.....	39,779.0	35,368.0	42,462.0
Percentage of error to total heat passing through engine per minute.....	2.2	2.7	3.8

Indicated HP.....	119.2	108.1	130.5
Pump HP.....	109.3	97.9	120.4
Efficiency per cent.....	91.7	90.6	92.3
Feed per I. HP. per hour through cylinders.....	15.05	14.53	14.57
jackets.....	2.12	2.30	2.10
Piston speed per minute per engine..... ft.	97.5	85.0	86.9
Boiler-pressure..... lbs.	59.3	80.4	101.0
Number of expansions.....	9.2	13.2	14.1
T U per I. HP. per minute.....	334.0	327.0	325.0
Donkin's coefficient.....	273.5	265.2	260.6
T U per I. HP. per minute calculated from the temperature of the air-pump discharge.....	320.0	315.0	311.0
Lbs. of coal per I. HP. per hour, supposing feed taken from hot well and the coal to give up 11,000 T U per lb.....	1.74	1.72	1.70
Duty in 1,000,000 foot-lbs. of water raised per 112 lbs. of coal taking 88 per cent. efficiency.....	112.1	113.4	114.8
Disposal of Heat used—			
As indicated work..... per cent.	13.3	13.5	13.7
Rejected heat and error..... "	85.5	85.2	85.2
Radiation..... "	1.2	1.3	1.1

In order to ascertain exactly the dimensions of the engine and pump under test, the cylinder and pump covers were taken off, and gauges made of the diameters of the four cylinders and their piston-rods, and of the two pump-

plungers and their rods; these gauges were brought to London and measured with a standard Whitworth rule, the mean areas and lengths being as follows:

Low-pressure cylinders, area.....	1,013.0 sq. ins.
High " " ".....	251.0 "
Pump-plungers, " ".....	235.75 "
Stroke, length.....	26.00 ins.
Clearance in low-pressure cylinder.....	596.0 cub. ins.
" high " ".....	336.0 "

As before stated, the coal was not weighed, and in the table above 11,000 T U is taken.

The engine worked perfectly on all trials, and was easily handled.

THE ANTWERP WATER-WORKS.

THE English journal *Industries* contains the following letter from Antwerp, from which it would seem that there may be some doubt as to the practical results of Mr. Anderson's system of purification:

"SIR: I was astonished to read in your issue of the 27th August last the praises of the 'present' Antwerp water-supply and method of purification, in which latter there must be, in my opinion, something radically wrong. I agree with the first part of the article on 'Iron as a Water-Purifier,'—viz., with the efficiency of the purification effected by the filtration through spongy iron, as it was originally introduced at our water-works by Professor Bischoff. Seeing at the time the report of Dr. Edward Frankland, and after tasting the excellent water obtained by this process, I went to the expense of introducing the company's supply into my house, and found it excellent to use for all purposes. However, since the 'improved' method was introduced some time ago by Mr. Anderson, at Sir Frederick Abel's suggestion, the taste and smell of the water supplied has become so repulsive that the members of my family refuse to drink it, and I have been compelled to resume the use of the bright, cool, and palatable water from my shallow well, although I believe this is highly contaminated. In the large circle of my acquaintance, nobody dreams of using the company's water now for drinking purposes, all having, like myself, had to take again to their shallow wells. I would not on any account have taken in the company's supply had the quality of the original filtered water been what it is now. Although I am neither a chemist nor an engineer, it seems plain to me that Mr. Anderson's process is a mistake, for although some portion of the water may be purified very efficiently in the revolving cylinders, the larger portion is evidently not acted upon at all, retaining the unpleasant taste and smell of the Nethe water. If no more on the subject is heard from Antwerp, it is because grumbling in the papers is quite unfashionable, and of comparatively rare occurrence here, and the Antwerp population stands any amount of annoyance before resorting to it; besides this, the bulk of the inhabitants are dangerously indifferent to the quality of their drinking-water, whilst the few who are not keep domestic filters. I am sure that in any English town a storm of indignation would have swept away the new system twelve months ago, when also the foreign visitors to the exhibition got quite alarmed on tasting a drop of the company's water. But even the Antwerp Commissioners of Health already have felt several times compelled to remind the company strongly of their engagements with regard to the quality of the supply. Dr. Frankland described Nethe water in his report as 'muddy, unpalatable, colored, and much polluted,' and after the original filtration through spongy iron as 'colorless, bright, and palatable, fit for dietetic and all domestic purposes.' Such a conversion no doubt is a very great difficulty, but the company themselves have shown that it can be accomplished if they will not sacrifice efficiency of purification to their profits.

"Yours, etc., L. DE MILLAS.

"Antwerp, 15th September, 1886."

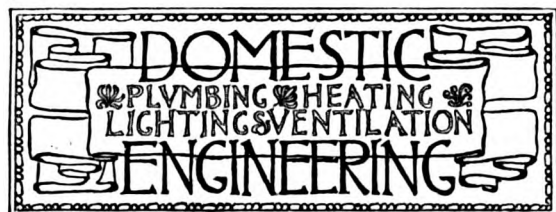
A FACT CONNECTED WITH THE BARTHOLDI STATUE.

THROUGHOUT the history of the building of the big statue and of the ceremonies attending its unveiling, the name of the gentleman whose services have been of the greatest value scarcely appears. It is that of Mr. David H. King, Jr.—*New York Sun*.

THE TREATMENT OF SEWAGE.

THE *Journal of the Society of Arts*, London, gives up sixty-three of the pages of its October 8 issue to a reprint of the full text of Dr. C. Meymott-Tidy's paper on the above subject, read before the Society last April. A summary of Dr. Tidy's conclusions will be found in THE SANITARY ENGINEER of August 5.

THE International Sanitary Congress will open in Vienna in September, 1887. Crown Prince Rudolph and Prime Minister Von Taaffe are to be its presidents.



DOMESTIC ENGINEERING AND PRACTICAL SANITATION DURING THE MONTREAL SMALL-POX EPIDEMIC.

THE small-pox epidemic in Montreal in 1885 is one of great interest to practical sanitarians. After several years of freedom from the disease, a case of mild small-pox, or varioloid, in the person of a Pullman car conductor, who probably contracted it in Chicago, was admitted to a private ward in the Hotel Dieu Hospital of Montreal on the 28th of February, 1885. Other cases followed, and the disease finally obtained a foothold among the French population of the city, a large proportion of whom were unprotected by vaccination, and who did not realize the necessity for such protection or for taking precautions to prevent the transmission of the disease from one person to another.

Under these circumstances the contagion spread rapidly, and before the municipal authorities had fully realized the gravity of the situation the epidemic had assumed alarming proportions. At one time there were nearly 2,000 cases of small-pox in the city, and the deaths from this cause were over 80 per day. The hospital accommodation for this class of patients soon became insufficient, and the expedient of adding new wards to the old city hospital did not give satisfactory results.

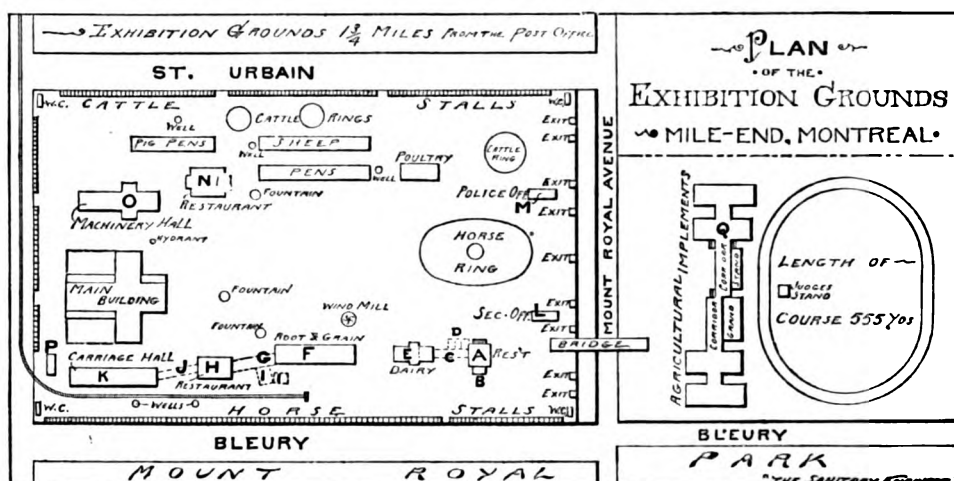
After much discussion and controversy it was finally decided that the best thing that could be done to provide satisfactory accommodation for and isolation of the large number of patients whom it was found necessary to remove to hospital, would be to take possession of the exhibition grounds and buildings in the vicinity of the city, and fit these up as a small-pox hospital. To do this promptly and satisfactorily was no small task, in view of the difficult problems presented. It was, however, accomplished, with excellent results, and we feel sure that the readers of THE SANITARY ENGINEER will be interested in knowing how it was done. We have great pleasure therefore in laying before them the following account of the work, which has been prepared by Mr. J. W. Hughes, of that city, whose name is a guarantee of the accuracy of the report, our illustrations being made from sketches furnished us by him.

Mr. Hughes writes:

I was waited upon by one of our most energetic and influential citizens, and requested to take charge of the fitting-up of the exhibition buildings for the reception of small-pox patients. Feeling deeply interested in the question, and having confidence in the gentleman who requested me to act for him, I consented, and immediately got to work. The first question, of course, was to get possession of the buildings. This, in the then excited state of the public, was a serious and difficult matter. There had been anti-vaccination riots a day or two before, and the different local military organizations were under arms, and it was decided that it would be necessary to have military protection in the operation. Accordingly, accompanied by the gentleman in question and the proprietor of one of the city papers, we repaired to the headquarters of one of the city regiments, and after a short delay the grounds and buildings were taken possession of, military guards posted, and the work of preparation began without a moment's loss of time. Consultations were held with physicians and others, and no time was lost in deciding what to do, and although considerable opposition was met with during the first few days, and actions for injunction were instituted, and several times the buildings were taken possession of and locked up by the guardian of the property during temporary absence of the workmen, still the work went bravely on. Then the Health Department officials, and the citizens generally, finding the buildings were rapidly being got ready, took hold with a will. The military guards were assisted by the police and firemen, and Mr. Leveque, on behalf of the Board of Health, assumed official control of the work, which was carried on by workmen furnished by different firms. There were employed the workmen of four firms of carpenters, and forty men from the Grand Trunk Railway Company, two firms of bricklayers, four firms of tinsmiths, three firms of plumbers, three firms of stove manufacturers,

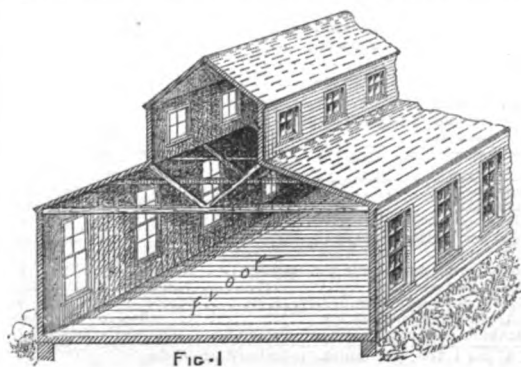
one boiler-manufacturing firm, the electric-light company, and laborers, supply-houses, etc., in as great numbers as were necessary. The different firms in many cases stopped their ordinary business to send men to work on the hospitals. The electric-light company had the buildings and grounds lit up within thirty-six hours, and the work went on night and day, including Sundays, the men in large numbers taking their meals on the grounds, one of the buildings being fitted up as a restaurant for the purpose.

In order that the reader may understand the nature of the work, the following plan of the grounds and buildings may prove useful, and in this connection it may be stated that only the buildings detached from the main buildings were used, they being of wood and of such a character as to be easily disinfected, or if necessary burnt when their use as hospitals became no longer necessary, it being thought wise not to use the main or Permanent Exhibition building for hospital purposes, except as a last resort, and after all the other buildings were occupied.



A on the plan is the restaurant, B the kitchen attached to same, and used as the residence and headquarters for the nurses and those in charge of the Protestant patients who were to be in building E. A and E were connected by a spacious corridor C, adjoining which were constructed rooms D for private patients. E was a building about 150 feet long and 50 feet wide, which was divided by two partitions in the centre, shown by dotted lines, into male and female wards, the space between dotted lines forming a room for general purposes. The building A was divided into apartments, and sleeping accommodation was provided for the nurses, as shown in the shaded part of plan.

It will be here necessary, in order that the reader may have an idea of the work done, to give a brief description of the nature of the buildings before they were converted into hospitals. They were built of wood on stone foundations, well framed, but only protected from the weather by clap-boarding on the outside of the framing. They were provided with an abundance of large windows, and had pitched roofs, shingled, and open from floor to peak of roof, with the exception of building K, which had a roof provided with a row of windows as shown in the sketch, Fig. 1. In order to secure the necessary protection from



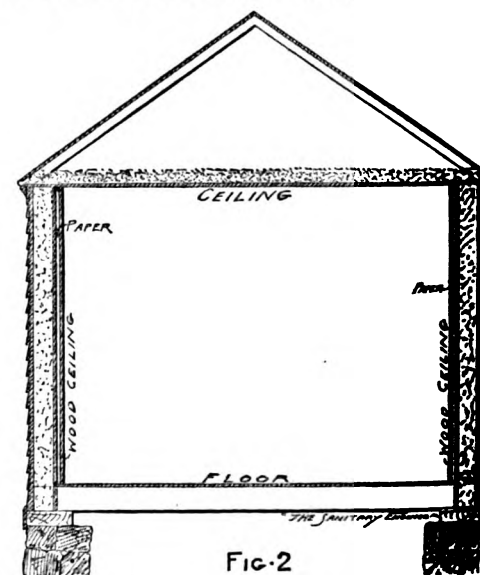
the weather, heavy building-paper was nailed on to the inside of the framing of the buildings, and then a lining of 1-inch planed, grooved, and tongued boards was placed over the paper and a ceiling of grooved and tongued boards was laid upon the cross-rafter and the whole whitewashed. (Fig. 2.) The connecting corridors were built in a similar manner to the main buildings and the spaces between the paneling and inside ceiling, besides having the paper protection, were filled with sawdust, as well as the space between roof and ceiling of corridors.

Building F was about 250 feet long by 50 feet wide. H was a building say 100 feet square, K a building 300 feet by say 75 feet wide. These three buildings were divided into suitable wards and rooms, and the whole connected together by corridors J and G, the building H being fitted up as nurses' residence and headquarters, and provided with kitchen accommodation. F was used as the male ward for Roman Catholic patients, and K for the Roman Catholic women and children. Private wards were also divided off in these buildings. The corridors averaged eighty feet in length, were about eight feet wide and eight feet high, well warmed and lighted, and were intended to be used as promenades for the convalescents as well as a means of communication between buildings. I shows the chapel for the Roman Catholic patients. It was provided by moving an existing building, F, and attaching it to the corridor G.

N was the large exhibition restaurant. It was used during the construction of the hospitals as a dining-room for

the guards and workmen. O, a portion of this building about 100x75 feet, was divided into three apartments, and fitted up as a laundry, consisting of boiler-room, washing-room, work-room, and drying-room. P was the incinerator constructed for burning the garbage. Q, the building in which were situated boiler and engine and dynamos for supplying electric-light. L was the military headquarters. M, headquarters for police and firemen, and telephone office. These latter buildings were afterward used for general purposes, reception-rooms, offices, etc. Each of the headquarters were fitted with telephones, and the furniture, etc., was comfortable and substantial, but not necessary to be described in this article.

It is now in order to describe the plumbing, heating, and sanitary apparatus. The introduction of the water was not a difficult matter, as the city water was laid on to the grounds, it being supplied from the city mains by means of a pumping-engine situated at the head of one of the city streets. This engine was rendered necessary owing to the position of the exhibition buildings, they not being



situated so as to be supplied direct from the city mains by gravity. The engine being in position, but little time was lost in getting on the water. This portion of the work was carried out by the Superintendent of the Water Department, L. Lessage, Esq., who also took charge of the work of introducing the pipes into the different buildings,

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VOLUME 14.]

NEW YORK, NOVEMBER 6, 1886.

[NUMBER 23



For works for which proposals are requested, see also the "Proposal Column," pages 537 and 538.

CONSTRUCTION.

WATER-WORKS WANTED.—Isaac W. Smith, Engineer of the Water Committee of Portland, Oregon, has advertised that he will receive proposals for water-supply work until December 15. The work will be constructed according to the printed specification, dated August 24, 1886, which calls for 31 miles of wrought-iron pipe, 27 and 22 inches in diameter; 3 iron bridges; 2,000 feet of submerged pipe under the Willamette River; a reservoir within the city limits, and other work. Mr. Smith will furnish copies of the specification. Proposals should be addressed to Philip C. Schuyler, Clerk of the Water Committee.

PUMPING-ENGINES WANTED.—On November 9, the trustees of the Youngstown, O., City Water-Works will open proposals for a direct acting horizontal compound duplex condensing pumping-engine, 36-inch stroke, without crank or fly-wheel. The engine must have a capacity sufficient to raise 5,000,000 gallons of water in 24 hours against a pressure not exceeding 90 pounds per square inch for domestic purposes, and 130 pounds for fire purposes, including suction lift, and when running at a piston speed not exceeding 90 feet per minute. The contractor must guarantee the engine shall develop a duty of sixty million foot pounds for each one hundred pounds of bituminous coal consumed, when performing the above-mentioned domestic services. The secretary of the board is D. N. Simpkins.

NEWTON, MASS.—At a meeting of the Aldermen November 1, an order was passed authorizing the Water Board to purchase 600 tons of water-pipe for delivery next spring.

STERLING, KAN.—A vote is to be taken here on the question of building water-works.

BALLINGFR, TEX.—A water company has been incorporated here and works will be built at once.

JOLIET, ILL., is looking into water-works, and has sent a delegation to Aurora the other day to investigate the works there.

STORM LAKE, IOWA, wants a supply of water for fire purposes.

NORRISTOWN, PA.—The trustees of the State Hospital for the Insane will ask the Legislature to appropriate \$50,000 to provide their own system of water-works, and \$400,000 for the erection of new buildings.

CINCINNATI, O.—At a meeting of the Board of Aldermen October 22, it was voted to supply water to Avondale for twenty years at city rates.

REFRIGERATING-MACHINERY.—In our Proposal Column will be found an abstract of a proposal for refrigerating-apparatus for the Hamilton County morgue.

BROOKLYN.—At the meeting of the Aldermen October 28, resolutions were referred to the Water and Drainage Committee, making provision for the issue of bonds to raise \$28,-

000 to pay for constructing a new force main from the engine-house in Underhill Avenue to the Prospect Hill Reservoir.

Steps will be taken for the grading and paving of Bushwick Avenue, from Myrtle Avenue to the City Line, with Belgian block, also for paving Central Avenue, from Ivy Street to Evergreen Cemetery.

CAMDEN, N. J.—On October 25, the Water Committee of City Council had under discussion the city loan for raising \$100,000 to improve the water-supply (\$25,000 for pumping-engine, \$30,000 for a larger reservoir, and \$45,000 for extending the pipe system). Action was deferred until the next meeting of the Committee. Mr. Stradling is chairman. One thousand additional feet of 6-inch water-pipe will be laid at once.

JERSEY CITY, N. J.—A syphon of iron pipe to carry a water-main under the tracks of the New Jersey Junction Railroad at the Newark Avenue crossing. The railroad builds the syphon, and gives bonds in \$25,000 to keep it in repair.

CHATTANOOGA, TENN.—We have referred before to the supply of water to be furnished by the Mountain Spring Water Company now leased to Philadelphia capitalists. It is now stated that preliminary matters have been arranged and the laying of pipe will begin in ninety days.

GREAT DRAINAGE PROJECT.—In our issue of August 12 we gave a summary of the report of James B. Francis, Eliot C. Clarke, and Clemens Herschel, on the means to obviate the flooding during storms of Roxbury and Boston Back Bay District by the overcharging of Stony Brook conduit. Their report was referred to a committee of Aldermen (Donovan, Coe, and Barr), and their finding has just been sent to the board, with recommendations for speedy work. The plan contemplates the construction of a new channel for the brook, from a point 700 feet above the Tremont Street crossing of the Boston and Providence Railroad to the pond of the Back Bay Park, a distance of 4,542 feet, and estimated to cost \$593,880. In connection with this part of the improvement, the committee recommend that the present culverts of the brook in West Roxbury be enlarged, and the obstructions removed therefrom, in order to afford an increased capacity for water flowage; and, in the opinion of the city engineer, this can all be accomplished if the round sum of \$600,000, is appropriated for the two objects. The committee are informed that it will be advisable to apply to the Legislature for authority to take lands that may be required in building the proposed new channel; and they accordingly submit the necessary application, together with an order authorizing a loan of \$600,000, to defray the expense of construction.

DALLAS, TEX., is agitating to carry out plans prepared by Chester B. Davis, C. E., of Chicago, for water-works; cost, \$300,000.

MONTCLAIR, N. J., is agitated over the discussion of a system of sewerage.

BRIDGEPORT, CONN.—The City Council has under consideration the building of the Yellow Mill trunk sewer. Opinion is divided on the advisability of beginning work this fall, or postponing all action till spring. Alderman James Staples can give further information.

MILWAUKEE.—Water-mains will be laid in Commerce and Walker Streets as follows: on Commerce from Dock Street to Reservoir

Avenue, and on Walker from Clinton to Barclay Street.

The Board of Public Works will advertise for bids for a suitable steam-heating apparatus for the Eleventh District school building not to exceed \$7,000 in cost.

A pipe sewer will be laid in Rogers Street from First Avenue to Third Avenue, and a brick sewer on Oakland Avenue near Bradford Street, at an early date.

Eighteen hundred dollars has been appropriated for a steam-heating apparatus to be placed in the West Side police station.

Water-mains will be laid on Sobieski Street from Brady to Hamilton Streets; also on Clybourn Street, between Twenty-ninth and Thirtieth Streets, in the Fourth Ward.

A new bridge will be built from Sycamore Street to Michigan Street across the Milwaukee River at those points.

CENTRAL FALLS, R. I.—Plans for sewerage of this village have been prepared by Mr. Arthur R. Sweet by order of the council of Lincoln township. The village is part of a drainage district for the whole of which Mr. Sweet has prepared sewerage plans for ultimate execution. These provide for 19,875 lineal feet of sewers, 23 flush-tanks, 707 manholes, 87 lamp-holes, 78 catch-basins, and 19 gutters. The sewers will range in size from eight inches to thirty-six inches in diameter, and the estimated cost of 19,875 feet is \$66,155.98—\$17,594.67 per mile. The present work is to be confined to certain parts of the village, and Mr. Sweet has estimated its cost at \$10,077.

PITTSBURG, PA., SEWERAGE.—On October 28 the commission appointed by councils to suggest a system of sewerage for the East End held a meeting and had a general discussion of the law and the means of payment. It appears that a sewerage system is greatly needed, but that the constitutional indebtedness is now reached. Mr. E. M. Bigelow, City Engineer, said that the area to be drained would necessitate over 100 miles of sewerage. The committee has appointed another meeting for to-day. The chairman is John Dunlap. A sewer with an area of sixty-three square feet would drain forever the largest basin in Pittsburgh. This would be equal to about a 9-foot circular sewer.

GAS PLANT.—On October 27 the Chesapeake Gas Company directors, of Baltimore, Md., voted to increase the capital stock from \$1,500,000 to \$3,000,000 to provide additions to the works, and extensions of mains, increasing the capacity of the plant to 1,200,000,000 cubic feet per annum.

SOUTHURBY, CONN.—The Selectmen of this town want bids for building the abutments of a bridge across the Housatonic River, between Southbury and Newton.

CHICAGO.—City Engineer Artingstall has recently been consulted by the Chicago and North-western Railroad Company in reference to still another viaduct and bridge across the river at Dearborn Street. The matter will be brought before City Council, and meantime the railroad is having plans prepared for the structure. Marvin Hughitt is Vice-President of the road.

PHILADELPHIA.—Address Henry Clay, Electric Pneumatic Company, 422 Library Street, in regard to work to be begun very soon of constructing the pneumatic conduits for transmission of packages, etc. The company operates under a franchise granted July 8, 1886.

MISSISSIPPI RIVER IMPROVEMENT.—Address General W. S. Ferguson, of Greenville, Miss., on the subject of doing work under the allotments made by the commission.

BROOKLYN.—Secretary of the Navy William C. Whitney last week inspected the great basin at the Brooklyn Navy Yard, to be known as the Whitney Basin, and will ask Congress to appropriate \$80,000 to proceed with work at the basin.

BUFFALO, N. Y.—The Board of Fire Commissioners have caused plans and specifications to be prepared for a fire-boat, and ask for bids until November 8. The specifications call for a boat of iron throughout, 80 feet long over all, 20 feet beam, and draught not to exceed 6½ feet, depth of hold 9 feet. Two direct-acting engines, with cylinders 16 inches in diameter and an 18-inch stroke, will furnish the power, and the cylindrical boiler, 11 feet in diameter and 11 feet long, will sustain 100 pounds steam-pressure. A 6¼-foot propeller-wheel will work on a shaft not less than 5¼ inches in diameter. The commissioners have not yet decided on the style of pumps to be put in, but it is stated that they will be of a capacity of 4,000 gallons per minute.

CLEVELAND, O.—A stock company will be formed to build and equip a large bathing establishment here for which plans have already been prepared. It is expected to erect a 3-story building on a plot of ground 67x95 feet, with Russian, Turkish, and other baths. The manager is E. J. Weil.

DETROIT, MICH.—Detroit capitalists have decided to build a pipe-line to bring natural-gas from a district in Canada thirty miles from Mackinac Straits, laying the pipe across the straits. It is understood a large contract for iron pipe has been placed with the National Tube-Works, of McKeesport, Pa. Work on the pipe-line will be begun in the spring.

THE National Dredging Company has filed articles in the clerk's office of this county. The object is to construct dredging-machines. The capital is put at \$150,000. The incorporators are General Daniel E. Sickles, John E. Walsh, Edward Annam, Daniel Bougham, William S. Chapman.

ELMIRA, N. Y.—The following bids for constructing a stone bulkhead at outlet of main sewer have been received by John B. Stanchfield, Mayor: Beardsly & Cavanaugh, Elmira, N. Y., excavation per cubic yard, 38c.; filling per cubic yard, 24c.; masonry per cubic yard, \$4.95; iron gate, complete, \$65; iron, per pound, except iron gate, 10c. John McGrievy, 53c., 23c., \$6.69, \$67, 4c.

JERSEY CITY, N. J.—The following bids for improvement of Jackson Avenue were received by John Schweiler, Chairman of Committee on Streets and Sewers, October 25: James Kelter, \$16,545.50; M. Curley, \$16,713.50; M. Henry, \$18,318; Thomas Cavanaugh, \$17,162.50; T. H. O'Neill, \$15,000; T. C. Meehan, \$24,056.50. The quantities were as follows: 9,000 cubic yards of earth excavation, 100 cubic yards of rock excavation, 2,000 cubic yards of earth filling, 1,000 cubic yards of sand or gravel filling, 2,500 square yards of stone paving, 6,600 lineal feet of new curb-stone, 2,500 square feet of new bridge-stone, 24,600 square feet of flagging, 50 square yards of repaving, 600 lineal feet of reset curb-stone; 400 square feet of relaid bridge-stone, 3,400 square feet of relaid flagging, 11 basins to be rebuilt, 12 manholes to be brought to grade.

HARRISBURG, PA.—The Steam-Heat and Power Company has awarded a contract to the Harrisburg Foundry and Machine Company for six tubular boilers, with all fittings complete, 6 feet diameter, 18 feet long, for \$15,000.

SHEBOYGAN, WIS.—On October 15, the Mayor and Council opened bids for constructing and maintaining a system of water-works. They were to be based on the assumption that at least 12 miles of pipe and 150 hydrants would be required. Thirteen bids were presented. By vote of council names of bidders were withheld, and bids were indicated solely by numbers. Consequently, we are able to give only the name of the firm with whom the making of a contract is recommended—viz., The American Water-Works and Guarantee Company, Limited (bid No. 2). The only bids considered were Nos. 2, 10, and 12, which were referred to Mr. Edgar Williams, Consulting Engineer, to report. In detail they were as follows:

No. 2.—3,000,000 gallons pumping capacity, and running at a piston speed of 100 feet: 12 miles and 180 hydrants will be furnished for \$5,490; 15 miles and 219 hydrants for \$6,660.

No. 2.—4,000,000 gallons capacity: 12 miles and 200 hydrants, \$7,600; 15 miles and 239 hydrants, \$8,770.

No. 10.—3,000,000 gallons capacity, and running at a piston speed of 100 feet: 12 miles and 150 hydrants, \$6,375; 15 miles and 200 hydrants, \$7,200.

No. 12.—4,000,000 gallons pumping capacity, piston speed not given: 13 miles and 150 hydrants, with what additional hydrants the city requires in this 13 miles, \$6,000; 15 miles and 20 additional hydrants, \$6,700.

In proposal No. 2, the additional hydrants are \$30 per year, and in proposal No. 12 the hydrants are \$35 per year.

Mr. Williams recommended the acceptance of a No. 2 bid, with the stipulation that a stand-pipe of 300,000 gallons be erected, and that all cast-iron pipe be capable of resisting 300 pounds hydrostatic pressure, and be coated with Angus Smith's coal-tar coating. Council then ordered that the question of accepting a bid of the American Water-Works and Guarantee Company, on the basis of 15 miles of mains, 239 hydrants, and a stand-pipe 140 feet high and 20 feet in diameter, annual rental not to exceed \$6,600, be submitted to a popular election, to be held November 2.

SHEBOYGAN, WIS., November 4 (By Telegraph).—The city election, November 2, by 986 majority, authorized the making of a contract with the American Water-Works and Guarantee Company, of McKeesport, Pa., for fifteen miles of mains and 239 hydrants, annual rental \$6,660. W. Kunz, City Clerk.

NEWPORT, R. I.—On October 30 H. A. Bentley, City Engineer, opened proposals for furnishing about 1,500 lineal feet of 30-inch cast-iron flanged pipe for the outlet for the main sewer as follows: The McNeil Pipe and Foundry Co., Burlington, N. J., \$38 per gross ton of pipe, special castings 4 1/8 c. per pound; Gloucester Iron-Works, Gloucester City, N. J., \$40.91 per ton of pipe, \$86.91 per ton for special castings; Camden Iron-Works, Philadelphia, \$45 per ton for all; Warren Foundry and Machine Co., Phillipsburg, N. J., 1 1/4 c. per pound (\$42 a ton) for straight pipe, and 2 1/4 c. and 4 1/4 c. per pound for special castings. Contract awarded to the McNeil Pipe and Foundry Co. The contract for building the retaining-walls at the foot of Marsh Street was awarded to William Beattie, of Fall River, at \$6.75 per cubic yard. This contract includes the dredging for the walls and the furnishing and laying stone, and the aggregate cost is \$12,352.50.

DES MOINES, IOWA.—Associated Press dispatches, dated October 26, say that the City Council of Belle Plain have advertised for bids from parties who would attempt to control their great spouting artesian-well and had twenty-five responses, and have awarded the contract to a Marshalltown man. He is to shut off or control the well for \$2,000, and the work has been begun. The flow of the well for several weeks past has been 8,600,000 gallons every twenty-four hours. Since the contract for closing the old well was let a new well, three miles south-east of town, has begun spouting, sending a 2-inch stream many feet in the air.

CHELSEA, MASS.—For building reservoir on Powder-horn Hill and laying pipe to pumping-station, the contract has been awarded to Turnbull & Cheeny for \$15,781.50. Several other parties put in bids, but were ruled out, owing to certain provisions not being complied with.

LITTLE FALLS, N. Y.—Sullivan & Co., the water-works contractors, are pushing their work to completion. Twenty-eight hydrants have been placed in position for immediate use when the water arrives. When the distributing reservoir is finished the number of hydrants will be increased to fifty. The total number of hydrants in the village when the system is completed will be 128.

THE Pennsylvania Construction Company, Pittsburg, has received the contract at \$14,440 for the iron columns and iron beams for the ground floor of the U. S. Court House at Pittsburg.

BIRMINGHAM, ALA.—Shook & Ensley, of this place, have just closed a contract with J. P. Witherow, of Pittsburg, Pa., for the construction of a blast furnace to cost about \$250,000, with a capacity of 125 tons a day.

FALL RIVER, MASS.—The contract for the iron-work in the City Hall has been let to the Providence Architectural Iron-Works, of Providence, R. I.

NEW ORLEANS.—A contract has been awarded to Muir & Fromherz, of this city, for building the Edison Electric Illuminating Company's station on Baronne Street. Charles Carroll is president of the company.

BOSTON, MASS.—The proposals for bricks, masonry, stone, and iron setting for the basement and first floor of the new Court House were opened October 28. Bids are as follows:

J. H. Coon & Co., setting granite, iron, etc., \$49,000; laying old brick, \$5.50 per 1,000; furnishing and laying new brick, \$14.75; extra for setting brick in red mortar, \$6.

Thomas J. Lyon, setting granite, iron, etc., \$39,884; laying old brick, \$10.25 per 1,000; furnishing and laying new brick, \$19.97; extra for red mortar, \$1.25.

R. R. Mayers, setting granite, iron, etc., \$16,000; laying old brick, \$6.95 per 1,000; furnishing and laying new brick, \$15.50; extra for red mortar, 75 cents.

Sampson, Clark & Co., setting granite, iron, etc., \$13,400; laying old brick, \$8 per 1,000; furnishing and laying new brick, \$16; extra for red mortar, \$1.

Gooch & Pray, setting granite, iron, etc., \$10,973; laying old brick, \$6.97 per 1,000; laying and furnishing new brick, \$17.97; extra for red mortar, \$1.49.

David Conery, setting granite, iron, etc., \$31,000; laying old brick, \$6 per 1,000; laying and furnishing new brick, \$18; extra for red mortar, \$1.50.

Whidden, Hill & Co., setting granite, iron, etc., \$27,150; laying old brick, \$6.25 per 1,000; laying and furnishing new brick, \$18.50; extra for red mortar, 10 cents.

Woodbury & Leighton, setting granite, iron, etc., \$24,000; laying old brick, \$7.90 per 1,000; laying and furnishing new brick, \$16.90; extra for red mortar, \$8.75.

C. A. Dodge, setting granite, iron, etc., \$22,595; laying old brick, \$7.75 per 1,000; laying and furnishing new brick, \$16.75; extra for red mortar, \$1.

The number of bricks to be furnished is 5,000,000, of which 4,000,000 are to be old ones.

Proposals were opened October 29, for furnishing and delivering stone ballast for the abutments to the Beacon Street bridge over the Boston and Albany Railroad as follows: Milford Granite Company, \$7 per cubic yard; O. Nawn, \$3.50; James Welch, \$1.50; Frank W. Mead, \$1.90; and Timothy McCarthy, \$1.60.

The Water Committee of the Aldermen is considering an application to the State Legislature for a grant in conjunction with Chelsea, Somerville, and Everett, of the waters of the Shawshen. The Water Board asserts that an increased supply for the Mystic department is necessary.

GOVERNMENT WORK.

QUINCY, ILL.—Synopsis of bids for plumbing, etc., of Post-Office, etc., opened October 25, 1886: E. Best, Quincy, Ill., \$2,665.32; F. Ade & Co., New York, \$2,675; William Kirkup & Son, Cincinnati, O., \$2,600.

POTOMAC RIVER IMPROVEMENT.—The bids for dredging about 400,000 cubic feet of material, and also for furnishing rip-rap stone, printed in our last issue, have all been rejected as too high, and new proposals will be advertised for. For dredging 500,000 cubic yards in the tidal basin the contract has been awarded to Benson & McNee at 10 cents per cubic yard.

SYRACUSE, N. Y.—Synopsis of bids for plumbing etc., of Post-Office, etc., opened October 25, 1886: Pierce, Butler & Pierce, \$3,359.65; Colwell Lead Co., New York, \$3,659.75; Edward Joy, \$4,039.03; Fred. Ade & Co., \$4,100; William Kirkup & Sons, Cincinnati, O., \$3,699.98.

ABERDEEN, MISS.—Synopsis of bids for plaster models for Court House, etc., opened October 27, 1886: Alexander Doyle, \$291; H. D. A. Henning, \$185; F. Moreau, \$347; C. W. Buhler, \$104.

TOLEDO, O.—Synopsis of bids for iron-work and grille of Custom House, opened October 25, 1886: Manly & Cooper Manufacturing Co., \$749; Champlin Iron Fence Co., Kenton, O., \$447.56; Mathew Donovan, Toledo, O., \$709; The Sneed & Co. Iron-Works, \$1,075; Van Dorn Iron-Works, Cleveland, O., \$575; The Fred. J. Myers Manufacturing Co., Covington, Ky., \$1,110.

PITTSBURG, PA.—Synopsis of bids for iron-work of Court House, etc., opened October 25, 1886: Pennsylvania Construction Co., \$14,440; L. M. Moore, \$14,943; Marshall Foundry and Construction Co., \$14,850; Haugh, Ketcham & Co., \$15,995.71; Clark, Raffin & Co., Chicago, Ill., \$15,370.

PITTSBURG, PA.—Synopsis of bids for plaster models of Court-House, etc., opened October 27, 1886: Alexander Doyle, \$165; H. D. A. Henning, \$90; F. Moreau, \$100; C. W. Buhler, \$85.

NEW ALBANY, IND.—Synopsis of bids for plaster models of Court-House, etc., opened October 27, 1886: Alexander Doyle, \$471; H. D. A. Henning, \$440; F. Moreau, \$461; C. W. Buhler, \$272.

LOUISVILLE, KY.—Synopsis of bids for plaster models of Court-House, etc., opened October 27, 1886: Alexander Doyle, \$2,558; H. D. A. Henning, \$1,598; F. Moreau, \$2,584; C. W. Buhler, \$1,524.

COLUMBUS, O.—Synopsis of bids for plaster models of Court-House, etc., opened October 27, 1886: Alexander Doyle, \$405; H. D. A. Henning, \$177; F. Moreau, \$194; C. W. Buhler, \$91. Same building, models for iron stairs: Alexander Doyle, \$266; H. D. A. Henning, \$120; F. Moreau, \$160; C. W. Buhler, \$150.

ATLANTA, GEO.—The following bids for constructing officers' quarters, hospital, and guard-house, were received by Captain J. W. Jacobs, A. Q. M., U. S. A., October 30:

BIDDERS.		
Bowe & Maher, Atlanta, Geo.	\$13,795	Officers' Quarters, No. 1.
Harris & Wilson, Newport, Ky.	13,400	Officers' Quarters, No. 2.
J. H. Coster, Baltimore.	12,216	Officers' Quarters, No. 3.
H. A. Howard, Atlanta, Geo.	11,920	Officers' Quarters, No. 4.
	11,600	Guard-House.
	4,870	Hospital.
	8,900	
	60,690	Total.

J. H. Mathews, Atlanta, Geo., for four officers' quarters, \$54,675; guard-house, \$6,934; hospital, \$11,672; total, \$73,281.

Hunnicut & Bellingrath, Atlanta, Geo., plumbing, tin, and metal-work, four officers' quarters, \$6,909; guard-house, \$680; hospital, \$1,545; total, \$9,134.

Atlanta Granite Co., Atlanta Geo., cut-stone work for all the buildings, \$1,079.

PHILADELPHIA, PA.—The following bids for furnishing and putting rip-rap in place

around foundation of 14-Foot Bank Lighthouse were received by Captain J. C. Mallory, U. S. Engineers, October 29: The Brandywine Granite Co., Wilmington, Del., \$2.17 per ton (2,240 pounds), in place; Davis B. Williams, Pickering P. O., Chester Co., Pa., \$3.09. The estimate of quantity was about 3,000 tons. The contract was awarded to the Brandywine Granite Company.

WILMINGTON, DEL.—The following bids for dredging in Susquehanna River, Md., were received by W. F. Smith, U. S. Agent, November 1: Thomas P. Morgan, Washington, D. C., 22c. per cubic yard, measured in place; Baltimore Dredging Co., Baltimore, Md., 22c.; Frank C. Somers, Philadelphia, Pa., 25c.; W. H. W. Morris, New York City, 25c.; American Dredging Co., Philadelphia, Pa., 23c.

MISCELLANEOUS.

CHICAGO ELEVATED RAILROAD.—On October 30, the Chicago West Division Elevated Railroad Company was incorporated, with a capital stock of \$10,000,000, to build an elevated railroad. The incorporators are Anson A. Lawrence, Edward T. Cahill, and George A. Dupuy.

NEW RAILROAD ENTERPRISE.—A special dispatch to the Boston Post dated October 28 states that Mr. Cornelius Vanderbilt, of New York, is at the head of a great syndicate which is going to build an air-line railroad from New York to Boston, for very fast train service. It is stated that a capital of \$25,000,000 has been pledged in London to the enterprise.

RAILROAD EXTENSION.—On November 11 the stockholders of the Memphis and Charleston Railroad will meet in Huntsville, Ala., and will discuss the extension from Stevenson to Chattanooga. The board of directors will report in favor. The president is Samuel Thomas, of New York City; the receiver, Henry Fink, of Knoxville, Tenn.

PHILADELPHIA.—Plans for the Metropolitan Underground Railroad, now asking councils for a franchise, have been prepared by John J. Deery, architect and engineer of the company.

CINCINNATI, O.—The Illinois Central Railroad and the Chesapeake and Ohio Railroad are proposing to build bridges over the Ohio River, the former at Cairo, the latter at Cincinnati. The projects have provoked the opposition of the Cincinnati Chamber of Commerce, which, under date of October 28, has prepared a report in opposition to them, signed by S. F. Covington, Chairman, to the Secretary of War, and to the Ohio Senators and Representatives in Congress.

NEW RAILROAD.—On November 2, Col. J. T. K. Hayward, President of the Missouri Central Railway Company, signed a first mortgage on the property preparatory to the issue of bonds for constructing the road.

EQUIPMENT OF ROAD.—It is stated that the Cincinnati, Hamilton and Dayton R. R. will put \$1,000,000 into new equipment. President, Hugh J. Jewett, New York; Superintendent, Charles Neilson, Cincinnati, O.

ON the Canadian Pacific Railway, Thamesford Section, it has been decided to work all night, and electric-light plants are being put up along the line.

TUNNEL-WORK.—It is stated that there will be required a 2,000-foot tunnel on the line of the railroad, for which surveys are now making from Hopewell Junction, on the line of the New York and New England Railroad to reach Lake Mahopac.

PROSPECTIVE TUNNEL-WORK.—The elevated railroad of Kansas City, Mo., has decided to tunnel under Eighth Street to Delaware and Main, as soon as the consent of council and of property owners can be obtained. It is said that the work will be one of the largest ever done in the city.

CONTRACTS have been let on the construction of the Georgia Central Railroad from Goodwater to Birmingham, Ala. Company's office is in Birmingham.

RAILROAD EXTENSION.—The Chicago and North-western Railroad, on October 29, let a contract to Harrison & Green, of Milwaukee, to construct about twenty-seven miles of railroad, from Iron River to Watersmeet. By the terms of the contract the railroad company furnishes iron and ties and lays the track, leaving the grading to be done by the contractors. The total cost to the company has been put at \$30,000 per mile.

RAILROAD CONSTRUCTION.—On October 23 the Turtle Creek Valley Railroad Company of Pennsylvania awarded a contract for constructing, ready for the railroad iron, six miles of track from Stewart Station to Murrysburg. The contractors are Booth & Flynn, of Pittsburgh. The president of the road is George Westinghouse.

NEW RAILROAD ENTERPRISE.—The Kansas City, Indian Territory, and Louisiana Railway Company has been incorporated in Kansas to build lines of railroad, amounting in all to 700 miles. The road is to begin at Kansas City. The directors are John N. Fullinwider, Eldorado, Kan.; Benjamin M. Weeks, Eldorado; Julius M. Turner, Columbus, Ind.; Melvern M. Porterfield, Kansas City, Mo.; R. J. McIntyre, Wichita, Kan.; and Robert Fullinwider, Crawfordsville, Ind. Capital stock, \$12,000,000.

FORT WAYNE, IND., Common Council has granted to the Natural-Gas, Oil, and Fuel Mining Company the right to lay mains and furnish gas, and work will, it is said, be begun at an early day. The secretary of the company is Charles B. Woodworth.

BROOKLINE, MASS.—The Selectmen have had an estimate prepared of the cost of widening Beacon Street, placing it at \$223,465.

DISSTON'S saw-works, of Philadelphia, will erect works in the natural-gas fields of Pennsylvania. Address S. T. Williams, superintendent.

NEW ARMORIES.—Plans for the Eighth and Twenty-second Regiments have been prepared by Architects G. B. Post and J. R. Thomas, and have been accepted by the Armory Board.

NEW CORPORATIONS.—The Ohio Valley Construction Company has filed a certificate of organization in the office of the County Clerk of Hudson County, N. J. The objects of the organization are the building, completing, enlarging, extending, improving, and equipping railroads. The principal office of the company will be located in Jersey City. The organizers are: Harry S. Ogden, Orange; Theodore M. Nevins, Bloomfield; Thomas Moore and Ezra Gildersleeve, New York; and Robert B. Smith, Jersey City.

INTERNATIONAL RAILWAY EXPOSITION AND CONGRESS.—Four main sections have now been established for the celebration of the semi-centennial of railways at the exhibition which will be held in Paris from May to October, 1887. They are: Railway Appliances and Industries; Congress for the Discussion of Tariffs, Safety, Comfort, etc.; Opening of the Line, Paris-St. Germain; Unveiling of a Statue to Marc Sequin, and Railway Jubilee. This exposition will comprise the various industrial and professional branches connected with railways, such as: Engineering and mechanics, locomotives, machinery, passenger-coaches and freight-cars, hoisting and wrecking apparatus, apparatus for heating and lighting, apparatus for intercommunication, couplers and other railway appliances, building, furnishing, and conveyance material, metallurgical and electrical apparatus, etc. Manufacturers and all others interested in the United States are invited by the management to co-operate in order to secure such an exhibit as will enhance their prospects of foreign trade and display the progress of this country. The Commissioner-General for the United States is Mr. John W. Weston, 230-236 La Salle Street, Chicago.

NEW YORK HARBOR IMPROVEMENTS.—Lieut. Colonel McFarland has submitted the following estimates of the amounts of money required to complete various projects:

	For 1887.	Total Cost.
Hudson River.....	\$35,000	\$94,000
Saugerties Harbor.....	15,000	26,419
Rondout Harbor.....	7,500	7,500
Harlem River.....	2,300,000	2,300,000
Newtown Creek.....	100,000	173,069
Gowanus Bay.....	50,000	120,064
Buttermilk Channel.....	50,000	113,750
Sheepshead Bay.....	10,000	13,200
Canarsie Bay.....	25,000	55,000
Sumpawanus Inlet.....	10,000	33,000
Manasquan River.....	33,000	33,000
Shrewsbury River.....	40,000	40,000
Keyport Harbor.....	10,000	10,000
Mattawan Creek.....	12,120	12,120
Cheesequakes Creek.....	50,000	50,000
Raritan Bay.....	75,000	75,000
Raritan River.....	100,000	622,412
South River.....	25,000	133,695
Woodbridge Creek.....	10,000	10,000
Rahway River.....	20,250	20,250
Elizabeth River.....	16,160	16,160
Channel between Staten Island and New Jersey.....	35,000	91,000
Passaic River.....	125,000	181,875

RIVER IMPROVEMENTS IN THE SOUTHWEST.—We condense the following notes from a special dispatch to the New Orleans Times

Democrat, containing the reports of United States Engineer officers:

In Alabama.

The most important work is the improvement of the channel of the harbor at Mobile. In order to carry out the present project, which is to secure a channel 200 feet wide, 17 feet deep at mean low tide, and 28½ miles long, 1,991,049 cubic yards of material must be removed. The amount available for this work is \$40,912, although it is estimated that only \$80,000 will be required for the completion of the existing project.

Warrior River. Whereas the amount estimated for the completion of the existing project is \$34,714, there is only \$19,264 available. This project is to remove the snags and bars, cut down the overhanging trees, and continue the work of bank revetment. It is expected that those improvements will afford safe navigation throughout the year, though during low water only for light draft boats, for the total length of river from Tuscaloosa and Demopolis. The Black River, Alabama, from Tuscaloosa to Daniel's Creek, has an estimate of \$463,854 for necessary work, with only \$102,352 available. The money will be used in providing a system of locks with movable dams in order to give transportation for coal barges from the Warrior coal fields.

In Mississippi.

Pearl River, Mississippi, between Edinburg and Carthage, requires \$10,964 and has only \$2,250. The money will be expended in general improvement of the channel. The same will be done between Jackson and Carthage, for which \$29,000 is required, but which has only \$2,250. Below Jackson there is the same lack of funds, only \$12,626 to do \$70,000 worth of work. It is proposed to apply the money in deepening and widening the cut-off, situated near the head of West Pearl River, closing Farr Slough, Parker's Bayou, Twin Bayou, and Little Homes Bayou, and to so improve the channel as to give a two-foot draft at low water as far up as possible. The bar at the mouth of the East Pearl River will be deepened.

Passagoula River, Mississippi. The amount available is \$25,113, and the amount required for preserving the improvements already made only \$2,500.

Twenty thousand two hundred and forty-five dollars will complete the existing project for Noxubee River, Mississippi, and \$7,662 are available. The project is to secure a navigable channel from the mouth of the river to Macon, which is being done.

The improvement of the roadstead that leads into the Back Bay of Biloxi, Miss., will require \$37,500, whereas \$17,488 are available. The purpose is to deepen the channel from four and one-half to eight feet.

The Tombigbee River, Miss., has \$19,589 available to cover \$18,888, estimated amount of work. It is proposed to use these funds above Vienna in completing the snagging and bank trimming over the unfinished three miles below Pickensville, and below Vienna in completing the work of bar improvement between Mobile and Demopolis.

Old Town Creek, Miss., requires \$7,000 for the purpose of removing obstructions to high-water navigation as far as City Point, but, no funds being available, the work will be at a standstill for a while.

No appropriation is made for the Yazoo River, Miss., so no work will be done.

The same is the case with Sunflower River, Tohula Lake, Tallahatchee River, Yallahusha River, Steele's Bayou, Big Black River, Hatchee River, South Forked Deer River—no appropriations.

In Arkansas.

The project for the improvement of the Black, Arkansas, and Missouri Rivers calls for an annual expense of \$8,000. For the present fiscal year there is \$5,502 available. The intention is to remove the obstructions and the improvement of the shoals, the latter by wing dams, and to close up a few sloughs in order to confine the water to the main channel.

No appropriation was made for L'Aguille River, Arkansas, and no work will be done this year.

The improvement of the Arkansas River at Pine Bluff demands \$8,000 annually. This year \$10,465 is available. The work already done there has put the river under complete control, and the yearly expenditure of \$8,000 is simply to preserve what has already been accomplished.

St. Francis River, Arkansas, calls for an annual outlay of \$8,000, and this year \$8,064 is available. The work so far done has been

removing snags and generally improving the channel.

The improvement of White River, Arkansas, will require \$10,000 per annum; this year \$25,936 is available. The funds at hand will be used in opening a narrow channel, but, as far as possible, the work will be in keeping with the plans of permanent improvement which will eventually be drawn.

The plan for the improvement of the Arkansas River requires \$253,544 for its completion, and only \$52,000 is available. Work will also be continued in surveys of the river, for which there is a sufficient appropriation.

Five thousand four hundred dollars is available for a continuation of the examination of Little Red River, Ark., \$7,000 for Red River, above Fulton, and \$3,500 for Petit Jean River.

There is also a sum of \$35,000 available for the removal of obstructions in the Arkansas River, which will be applied this year.

KANSAS CITY papers report that a case of some interest has been recently passed upon in the U. S. District Court at Kansas City. Judge Brewer, rendering an opinion in the case of the National Water Works Company of New York City against Kansas City, sustaining the demurrer of the city. The plaintiffs own and operate the water-works of the city of Kansas, and in 1883 they laid water-mains on a part of Eighth Street at the request of the city council, and in accordance with their contract with the city. In 1884 the city constructed a sewer in the same part of Eighth Street in which the water-mains were located, which necessitated their removal. They were removed and placed in another part of the street at the expense of the water company, the city refusing to bear any part of the expense. The plaintiff company claim that as they are compelled to locate their mains at places designated by the council they should be paid the expense of their removal. The city filed a demurrer to the petition, in which it set forth that it was necessary to the public health that a sewer should be placed on Eighth Street, and that there was no malicious design in placing the sewer in the same part of the streets in which the water-mains were located. Judge Brewer, in passing on the demurrer, said that as sewerage was a matter which greatly affected the public health, the city had no right to delegate any authority which would in any manner jeopardize the health of the people. He cited several instances where the United States Supreme Court had held to that opinion and sustained the demurrer to the petition.

MR. J. W. POWELL, Director of the U. S. Geological Survey, has just sent in his seventh annual report. By the topographical division 81,829 square miles in twenty States and Territories have been surveyed during the fiscal year. It is estimated that there are 100,000 square miles of coastal lands which, valueless in their present condition, might be reclaimed; but the director thinks it would be unwise to begin until it has been ascertained whether these lands are rising or sinking, and a general investigation of the changes now in progress along the Atlantic coast has been undertaken.

[TOO LATE FOR CLASSIFICATION.]

CONSTRUCTION.

PINE BLUFF, ARK.—A system of water-works is to be established here. Information may be obtained of Mayor White.

BUILDING INTELLIGENCE.

(Continued from page 549.)

NEW YORK CITY—(Continued.)

170th st, s s, 100 ft w Franklin av, 6 frame dwells; cost, \$15,000; o, Henry H. Sherwood; a, W. W. Gardner.

66 E 79th st, br dwell; cost, \$25,000; o, Jas. S. V. Wooley; a, James E. Ware.

10th av, s w cor 108th st, 5 br flats and stores; cost, \$111,000; o, John F. Moore; a, D. & J. Jardine.

89th st, s s, 100 ft e 9th av, 10 br dwells; cost, \$150,000; o, Margaret Vanford; a, G. H. Schellinger.

Madison av, w s, 22 ft n 80th st, 2 br dwells; cost, \$30,000; o, a and b, E. Kilpatrick.

Stanton st, n w cor Orchard st, br flat and store; cost, \$18,000; o, T. B. Harnisch; a, Fred. Ebling.

BUILDING INTELLIGENCE.

ALTERATIONS, NEW YORK.

Little 12th st, s s, and Bloomfield st, n s, 100 e 13th st, 5 houses on each st; 10 1-story; total cost, \$10,000; o, John Glass & Son, 209 W 21st st; a, G. A. Schellenger.

52d st, s s, 7th av to Broadway, vaults under sidewalk, cost, abt \$5,000; o, A. R. Eno, 233 5th av; a, Robert Mook; b, James Rue.

123 E 21st st, rear, 2-story br exten; cost, \$5,000; o, C. W. Field, 123 E 21st st; a, A. J. Manning.

410-416 E 68th st, factory raised 2 stories; cost, \$5,400; o, F. S. Myers, 619 Broadway; a, G. H. Budlong; b, not selected.

835 5th av, br dwell; cost, \$7,000; o, Amos Cotting; a, McKenzie & McPherson; b, E. D. Lindsey.

BROOKLYN.

35-37 Columbia pl, 190 ft from State st, 2 br bldgs; cost, ea, \$10,000; o, Theo. Minford, 103 Wall st; a, Wm. Field & Son; b, R. R. Healy.

142-44 Somers st, 2 frame dwells; cost, ea, \$3,500; o, Mrs. Dora J. Fagan, 148 Somers st; a, Theo. Engelhardt.

S s Pacific st, 200 ft w New York av, br dwell; cost, \$14,000; o, Jeremiah Johnson, Jr., 150 Broadway; a, Geo. P. Chappel; b, James Ashfield & Son.

MISCELLANEOUS.

ALLEGHENY, PA.—Liberty st, br church; cost, \$28,000; o, Lutheran; a, L. W. Henigst; b, Rose & Fisher.

BALTIMORE, MD.—Architect Charles E. Cassell, n e cor Charles and Saratoga, is preparing plans for 20 marble front houses for Smith & Schwarz, to be built at Calvert st, bet 4th and 5th sts; estimated cost, \$60,000.

Architect Jackson C. Gott, s e cor Charles and Fayette sts, has prepared plans for a frame residence for H. Clay Tunis, to be built near Laurie, Md.; cost, abt \$12,000.

Architect Frank E. Davis, s e cor Fayette and Charles sts, is preparing plans for an addition to the Concordia-Opera House, s w cor Eutaw and German sts; estimated cost, abt \$25,000.

Architect Charles E. Cassell, n e cor Charles and Saratoga, is preparing plans for 9 houses for Dr. William A. Moule, Charles st, n of Preston; estimated cost, \$63,000.

Architect E. F. Baldwin is preparing plans for the new Catholic University to be built at Washington, D. C.

Architect Benjamin B. Owens has prepared plans for stone and frame cottage for Mr. Wallace King, Jr., to be built at Mt. Washington, Baltimore Co., Md.; estimated cost, \$6,000.

Architect Benjamin B. Owens has prepared plans for a frame dwelling for Mr. Joseph S. Johnson, to be built at St. Charles avenue, Baltimore Co.; estimated cost, \$6,500.

CHICAGO, ILL.—Stewart av and 31st st, 4-story elevator; cost, \$10,000; o, J. Eldridge; a, Miller & Thain.

3712-14 Wabash av, br dwell; cost, \$12,000; o, M. R. Stampowski.

3813-23 Aldine, br dwell; cost, \$13,000; o, Oliver & Hill.

323-29 S. Western av, br st and dwell; cost, \$20,000; o, M. G. Good.

278 Michigan av, br dwell; cost, \$23,000; o, H. E. Bucklen.

1152-58 Jackson, br dwell; cost, \$11,000; o, W. H. Mosher.

160-73 Western av, br st and flats; cost, \$18,000; o, Hugh W. Matthew; a, Wm. Strippelman & Co.; b, James McGraw.

712-14 Lake Shore Drive, br dwell; cost, \$43,000; o, V. C. Turner; a, Burnham & Root; b, D. Lane.

137-43 N. Desplaines, br stable; cost, \$13,000; o, C. D. Gammon; a, F. R. Schock.

280-90 S. Desplaines, br stores and flats; cost, \$28,000; o, A. A. & O. S. A. Sprague; a, Alfred Smith.

163-73½ Sebor, br flats; cost, \$27,000; o, A. A. & O. S. A. Sprague; a, A. Smith.

163-73½ Sebor, barns; cost, \$12,000; o, A. A. & O. S. A. Sprague; a, A. Smith.

BUILDING INTELLIGENCE.

CHICAGO.—Incorporated is the Chicago Amusement Company to build a place of amusement. Incorporators, H. T. Grace, L. L. Smith, and N. F. Gordon.

2206-08 Dearborn, br dwell; cost, \$10,000; o, B. & P. Mahon.

2900 Butler, br st and dwell; cost, \$10,000; o, John Ernst.

Washington av, st dwell; cost, \$11,000; o, P. F. Munger; a, G. Isaacson.

Ogden av and Harrison, br flats and stores; cost, \$20,000; o, Henry Corwith; a, L. B. Dixon.

Ogden av, near Harrison, br flats and stores; cost, \$16,000; o, Enos Ayers; a, George Beaumont.

Rear McCormick's Reaper Works; br and terra-cotta hotel and store; cost, \$11,000; o, F. Kimball; a, J. M. Van Osdel & Co.

173 21st st, flat and bldg, cost, \$10,000; o, J. F. Barney; a, C. M. Palmer.

406-10 Superior, br dwell; cost, \$16,000; o, W. G. Newberry; a, C. L. Stiles.

Michigan av, nr 14th st, st and terra-cotta dwell; cost, \$25,000; a, Ackermann & Sunderland; b, not let.

Chicago av, nr Larrabee, st and flat bldg; cost, \$11,000; o, C. Burton; a, John Otter.

Ogden av and Van Buren, br st and flats; cost, \$15,500; o, J. A. Baldwin; a, James McGrath.

37th st and Michigan av, st dwell; cost, \$28,000; o, S. S. Carter; a, Obernley & Evans.

N. State, above Schiller, br and st dwell; cost, \$16,000; o, G. Travers; a, L. G. Hallberg.

CINCINNATI, O.—324-330 McMeckan av, 4-story br bldg; cost, \$7,500; o, J. S. Sohn & Co.

268 Summit av, double 3-story br bldg; cost, \$7,500; o, G. W. Clark & Bro.; b, Thos. Hevering.

280 Moore st, 3½-story br bldg; cost, \$7,500; o, Elleck & Co.; b, Mr. Baker.

Wesley av, First Baptist Church; cost, \$40,000; a, D. S. Schureman; b, William Saints, Dayton, O.

Grandin Road, stone dwell; cost, \$20,000; o, Chas. Anderson, Jr.; a, Wm. Martin Aiking; b, Jas. Griffith & Sons, and Dennis Flaherty.

DETROIT, MICH.—63 Alexandrine st, br dwell; cost, \$10,000; o, C. B. Cole; a, C. L. Cole.

Ferry, br dwell; cost, \$15,000; o, J. Scott; a, W. Scott & Co.; b, H. Carew.

Trumbull, br church; cost, \$20,000; o, Trumbull av Pres. Society; a, Hess & Roseman.

587 Jefferson, br dwell; cost, \$30,000; o, H. B. Ledyard; a, G. W. Lloyd.

642 Michigan, br store; cost, \$10,000; o, Hugh S. Peoples.

45 Caulfield, br dwell; cost, \$12,000; o, M. A. Edwards; a, John Edwards.

11 Rowland, br office bldg; cost, \$12,000; o, J. Atkinson; a, M. L. Smith; b, P. Dee.

1105 Woodward, br dwell; cost, \$17,000; o, J. C. Buxton; a, W. Scott & Co.; b, H. Carew.

ERIE, PA.—West 9th st, 2-story br barn; cost, \$3,300; o, C. F. Adams; a, E. E. Myers, Detroit; b, H. Shank.

GRAND RAPIDS, MICH.—North Division, br business bldg and store; cost, \$5,000; o, Wm. Gelack; a, Sidney J. Osgood; b, contract not let.

South Division st, br business bldg and store; cost, \$10,000; o, C. M. Lenington; a, same as last; b, individual contract.

Br Holland Reform church; cost, \$10,000; a, same as last; b, day's work.

Cor Center and McDowell, fr Congregational church; cost, \$5,000; a, same as last; b, day's work.

BUILDING INTELLIGENCE.

MT. AUBURN, O.—Bigelow st, dwell; cost, \$6,000; o and b, A. Morrison; a, Theo. A. Richter.

MILWAUKEE, WIS.—E. side 13th street, between Grand av and Sycamore st, frame dwell; cost, \$7,000; o, S. C. West.

Cor 2d st and Grand av, br store; cost, \$12,000; o, Mr. Frohbach.

NASHVILLE, TENN.—Messrs. Smith & Sharp, architects, are preparing plans for the M. E. Church building at Murfreesboro, Tenn; cost, about \$20,000.

Also for a bank building for the South Pittsburg City Company, which will be built at once at South Pittsburg, Tenn.; cost, about \$5,000.

NORWOOD, O.—Mills av, frame dwell; cost, \$4,500; o, Geo. F. Albers; a, Theo. A. Richter, Jr.; b, Geo. B. Shafer.

PROVIDENCE, R. I.—Nothing of importance this week.

PHILADELPHIA, PA.—9th, bet Lehigh av and Huntingdon, 10 2-story dwells; o, M. L. Heist.

Darien, bet Lehigh av and Huntingdon, 11 2-story dwells; o, same as last.

Locust, bet 37th and 38th, 6 3-story dwells; o, James W. Carson.

Mulberry, above Harrison, 2 dwells; o, Thos. Rush.

Long Lane and Wharton, 12 2-story dwells; b, Thos. Meehan.

Ridge av, bet 24th and 25th, 3 stores and dwells; o, Jos. McMurray.

Field st, bet 11th and 12th, 6 2-story dwells; b, W. J. Cox.

Whisner, bet 11th and 12th, 6 2-story dwells; b, W. J. Cox.

Mascher, bet Lehigh av and Huntingdon, 4 dwells; b, A. M. Hoffman.

St. Bernard Place, bet Cheltenham av and Springfield, 2 dwells; b, Jas. D. Arthur.

Freeland av, s Penn, 2 dwells; o, Timothy Buckley.

Church and Garden, 6 dwells; b, Herman Gensheim.

Merion, bet 45th and 46th, 6 2-story dwells; b, Jno. Bateson, Jr.

7th and Germantown av, rebuilding factory; b, Brocklehurst & Ewing.

Berks, bet Gratz and 19th, 5 dwells; o, John L. Kates.

19th, bet Berks and Norris, 6 dwells; o, same as last.

Edgemont, bet Lehigh av and P. & R.R., 3-story br factory; o, John E. Jefford.

Broad, s Castle av, church bldg; o, Scotts Presby. Church; b, Thos. Gamon.

Cheltenham av, bet Wayne and Pulaski, 2 dwells; b, Geo. Hearst.

Heath, above Columbia av, 4 dwells; b, Fred. A. Hanby.

Orianna, above Cumberland, 2-story factory; b, Hugh French.

Willow Grove av, bet Stenton and R.R.R., 2 dwells; o, George S. Roth.

52d, bet Media and Paschall, iron bldg; o, Chambers Bro. & Co.

Arch, bet 7th and 8th, 6-story br store and factory; b, Alex. T. Richards.

Carlin, bet York and Cumberland, 4 dwells; b, Jos. N. Pattison.

Orsprey, n Spring Garden, 4 2-story dwells; o, Samuel Kennedy.

Sunnyside, bet R. R. R. and 35th, 4 2-story dwells; o, John F. Rechart.

3335 N. Broad, alt. and addn. to Masonic Home; b, John S. Connell.

Howard, s Gurney, 4 2-story dwells; o, John J. Campbell.

PRICE HILL, O.—8th and Hawthorne st, frame dwell; cost, \$6,500; o, A. Squire; a, Theo. A. Richter, Jr.; b, D. Belville.

READING, PA.—The Keystone Hook and Ladder Company will build a \$6,500 house.

BUILDING INTELLIGENCE.

ROCHESTER, N. Y.—The Rochester Safe Deposit Co. has purchased the northern part of the Clinton Hotel property frontage. They intend erecting a fire-proof building as soon as they obtain possession, which will be April 1, 1887.

Work has been commenced on addition to East Side Savings Bank Building on East Main Street, to cost about \$20,000. Warner & Brockett, architects.

North st, between Franklin and Amity, block of br flats; cost, \$18,000; o, W. W. Dean, Washington, D. C.; a, O. K. Foote; b, Strauchen & Pratt.

Hawthorne st, rectory; cost, \$5,000; o, St. John's E. Church; a, J. G. Cutter; b, J. Stewart.

Hawthorne st, fr dwell; cost, \$5,000; o, J. D. Butts; a, same as last.

Lake av, br barn; cost, \$8,000; o, George Bantel; a, Otis & Crandall.

SALT LAKE CITY.—The plans submitted by R. Kleiting and Panby & Co., of St. Louis, for the new penitentiary will be recommended to Washington for adoption. The cost is estimated at \$50,000.

ST. PAUL, MINN.—Fuller st, bet Farrington and Virginia, 2-story fr dwell; cost, \$5,000; o, F. G. Warner.

Goodrich av, bet Forbes and Leech, 2-story fr dwell; cost, \$10,000; o, N. Myrich.

St. Anthony, bet Prior and Railway, 2-story br store and dwell; cost, \$5,000; o, Murray, Fay & Chamberlain.

Summit av, bet Walnut and Western, 2½-story br and s double dwell; cost, \$23,000; o, G. B. Young and W. H. Lightner.

Ellen st, bet Gaultier and Elfelt, 2-story fr dwell and shed; cost, \$5,000; o, C. F. Burch.

Otis, bet John and Locust, 3-story br foundry; cost, \$13,000; o, Rice, Lane & Phillips.

WASHINGTON, D. C.—K, bet N Cap and 1st, 4 2-story br bldgs; cost, \$5,600; o, M. F. Locke; a, Oliver Cox.

Mass av, bet 17th and 18th, 3-story br bldg; o, A. Cheatham; a, Langley & Gettiner.

Garfield av, 2-story fr bldg; cost, \$10,000; o, F. B. Wisner; a, E. C. Gardner.

Prospect st, bet 33d and 34th, 4 2-story br bldgs; cost, \$10,000; o, W. B. West & Bro.

Arthur pl, 10 2-story br bldgs; cost, \$10,000; o, B. H. Warner & Co.

McLean av, 6 2-story br bldgs; cost, \$7,500; o, B. H. Warner & Co.

N V av, bet 6th and 7th, 2-story br bldg; cost, \$7,000; o, F. G. Bowen; a, Charles Cole.

Mass av, bet 21st and 22d, 3-story br bldg; cost, \$11,000; o, B. H. Warner; a, J. G. Hills.

L, bet 18th and 19th, 2-story br bldg; cost, \$10,000; o, Leland Stanford; a, Cluss & Shultz.

1708 R. I. av, 3-story br bldg; cost, \$12,000; o, F. M. Johnston; a, O. Domely.

4th and A, N E, 2 2-story br bldgs; cost, \$7,000; o and a, C. C. Meads.

Iowa Circle, 3-story br bldg; cost, \$15,000; o, William R. Riley; a, Robert Stead.

8th, bet S and T, 30 2-story br bldgs; cost, \$46,000; o, G. W. Uttermahle; a, W. H. German & Co.

L, bet 1st and N Cap, 4 2-story br bldgs; cost, \$10,000; o and a, P. N. Dwyer.

M, bet 12th and 13th, 3-story br bldg; cost, \$7,000; o, J. J. Shane, a, J. G. Germutter.

Canal and 3d st, 10 2-story br bldgs; cost, \$5,000; o, C. W. Howard; a, C. H. Denham & Co.

9th, bet P and Q, 3-story br bldg; cost, \$5,000; o, H. B. Moulton; a, O. Cox.

Ninety-nine permits less than \$5,000.

WORCESTER, MASS.—Nothing new to report

WATER - WASTE PREVENTION: Its importance and the evils due to its neglect. By HENRY C. MEYER, editor of THE SANITARY ENGINEER and CONSTRUCTION RECORD.

PRESS COMMENTS.

"The author has so carefully investigated the subject, and so clearly explains the different systems in use in different cities, that his description becomes his best argument. As a brief, concise treatise upon this subject the work is of the utmost value, the author making no unproven assertions, but bringing the systems and experiences of other cities to illustrate and enforce his statements. Appended to the valuable arrangement of the prevailing sources of waste and the remedies is a summary of the reports of the Boston Water Board, a report of the New York Commissioner of Public Works upon the consumption and waste of water in 1884, and many valuable letters upon the question of water-supply and waste from experienced engineers in all parts of the world. In giving this book to the public the author is deserving of praise as a true and practical economist, whose efforts will be appreciated by thinking men, if not by the public at large."—*Inland Architect and Builder*.

"A work that should be read and studied by every one." * * * —*Savannah News*.

"The author of this timely book is particularly adapted to deal with the questions he discusses. But few have given the subject so much attention, and no one could treat it more impartially. He is not only intimately acquainted with the water-supply of American cities, but has personally investigated the plans adopted for curtailing water-waste in various cities in Great Britain, the results of these investigations appearing in this work.

"As our cities increase in population, and new cities spring up, the demand for more water correspondingly increases. At the same time the water-supply is diminishing, and that which would otherwise be available is rendered unfit for use by the contamination of sewage and the refuse of manufactories. It is conceded that the inhabitants of a city should be supplied with all the water they can use. It is not with the *use*, but with the *waste* of water that the author deals.

"No patented appliances are recommended, but such simple means as are free to all. We recommend the careful reading of this little book to every resident of a city who is interested in its water-supply, and particularly to those who, by virtue of vested authority, have to some extent the matter of water-waste prevention in their hands."—*American Machinist*.

"The work is well adapted for popular circulation, because it discusses facts and deals in subjects involving the health of the people and the welfare of communities."—*Harrisburg Independent*.

"Though small in size, it is a work which represents a good deal of solid work. With the amount of information which it contains it ought to prove of no small use to the city governments of the country. It is a *vade mecum* for water commissioners, and will be a valuable little text-book for every water board in America. Briefly, Mr. Meyer's object is to show by a comparison between the systems and results in different cities in America and England how much money is annually wasted in the shape of water in our larger cities for the want of proper precautions, and how those precautions had best be taken. * * * Mr. Meyer's book is well got up, his arguments concisely stated, and his facts and figures well tabulated and arranged, the result being the production of a work which carries conviction with it, and which ought to be of no small value to the larger cities of the country in the future."—*Minneapolis Tribune*.

"It does not fall into the mistake of recommending a special system for all places." * * —*Montreal Star*.

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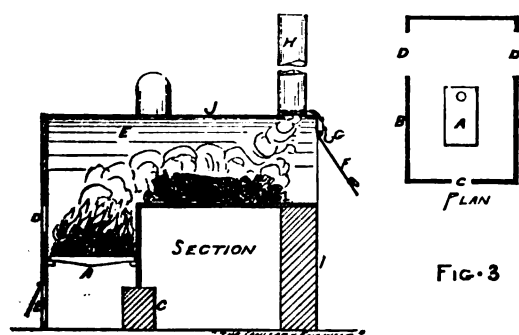
THE SANITARY ENGINEER AND CONSTRUCTION RECORD.

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Obtainable at London Office, 92 and 93 Fleet St., for 5s

Once inside the buildings the water was distributed to the different apparatus by means of iron pipes carried overhead. By so doing the heat of the wards prevents any danger of injury by frost. Where the pipes entered the buildings below the floor they were encased in large boxes which were filled with sawdust to guard against damage by frost. The pipes on the street leading to the grounds, as also on the grounds, were, owing to the nearness of rock to the surface, certain to freeze, as in many places there was not more than a foot of earth over them. They were protected by piling straw and planking over them, and no unusual trouble was experienced during the winter.

Owing to there being no available drains or sewers on the ground—and had there been it would not have been safe to empty the liquid wastes of so large a hospital into them—the problem of how to dispose of the wastes of the hospitals, liquid and solid, presented considerable difficulty, and for some time was the cause of earnest thought and anxiety to the writer, upon whom devolved the solution of this most important question. At one time it was contemplated to collect the liquid wastes into iron tanks, which were available as a portion of the plant of our Scavenging Department, and after disinfecting them to cart them out of the grounds and empty them into the city sewers. The solid matter was also to be disposed of by removal and burning in the incinerator used for destroying the city garbage. But to do this was to defeat one of the most important of the plans adopted for the stamping out of the plague—viz., isolation. It was felt that it would never do to have gangs of men at work about the hospitals for a portion of their time passing through parts of the city or outlying suburbs on their way to and from the different places of deposit; and then there was the uncertainty of thoroughly disinfecting the material. It was finally decided that all the wastes must be burnt on the grounds. Then came the problem of an incinerator that, while being effective, should be of such a nature as to be rapidly constructed and be easy of management. This part of the problem I disposed of by getting an old boiler of the locomotive pattern, removing all the tubes from it, putting into the fire-box a set of improved grate-bars, providing a handy means of opening and keeping open the door at the back end of the boiler, setting it up on a brick foundation, and fitting it with a sheet-iron smoke-stack thirty feet high. The whole was enclosed in a suitable shed so arranged that carts or sleighs could drive in one door, deposit their load in rear of the boiler, and go out by the opposite door. The garbage was thrown into the rear door, and as it became dried it was pushed forward by suitable tools upon the fire and burnt. See the plan of the old boiler converted into an incinerator and shed, Fig. 3.



A, fire-box and bars; B, draught-door; C, brick foundation; D, firing-door; E, space formerly filled with tubes, now the drying place of garbage before it finally passes on to the fire A; F, door at back of boiler kept open by means of hook and chain G while charging the incinerator; H, smoke-stack; I, brick pier supporting rear end of incinerator; J, shell of old boiler.

PLAN.

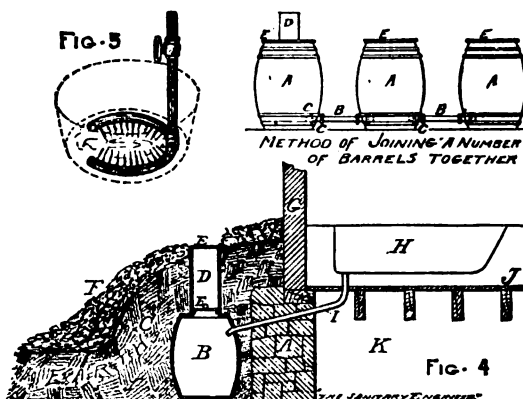
A, incinerator; B B, shed; C, door for entrance; D D, doors for vehicles.

I think the mode of working is sufficiently illustrated by the sketch, and I have been assured by Mr. W. Mann, who has charge of the Scavenging Department of our city and has had experience with the city incinerator, that it does its work well and answers the purpose admirably.

The liquid wastes are disposed of in a similar way, being mixed with the solid garbage, or with sawdust, and passed through the machine and evaporated.

A difficulty to be got over in collecting the liquid sewage was met with in the nearness of the rock to the surface, which rendered any pit-digging and tank-making out of the question, owing to the shortness of time at my disposal. This trouble was surmounted by using large wine-pipes

(barrels) of 120 gallons capacity, and placing them just outside the buildings as deep in the ground as the circumstances would permit, and placing the baths and sinks against the inside of the outer walls of buildings, and conducting the waste-pipes from them into the barrels. To prevent the contents of barrels from freezing, they were banked up with earth and then covered with manure, and a cover fitted over them having a shaft in centre of it extending above the surface. There were double covers fitted into these shafts, which were made large enough to permit of the insertion of a bucket or the large hose employed in connection with the improved tanks employed for such purposes. I believe the hose was used, a vacuum in the tank being the means employed for extracting the liquid. These barrels were emptied as often as was necessary, and where one barrel was not considered to afford sufficient storage capacity, several of them were joined together by means of a 2-inch iron pipe and lock-nuts. In some cases as many as six barrels were so connected. At one point where the rock came to the surface and the foundation of the building was too low to permit of a barrel being used, a water-tight wooden tank was employed, made shallow, and capable of holding 1,200 gallons. This was provided with a shaft and cover, and protected from cold in the way described. See sketch for the arrangement of this portion of the work, Fig. 4.



A, foundation of building; B, wine-pipe or barrel; C, earth filled up to prevent freezing; D, shaft for emptying barrel; E, covers in shaft; F, manure on top of earth C; G, wall of building; H, Bath; I, waste-pipe; J, floor; K, shallow space under floor.

SKETCH SHOWING METHOD OF JOINING A NUMBER OF BARRELS TOGETHER TO MAKE ONE TANK.

A, barrels; B, iron connecting-pipe; C, lock-nuts; D, emptying shaft.

There was also the laundry question to be solved. To meet this want a portion of the building, marked O on the plan, was partitioned off and divided into three compartments—one part containing the wash-tubs, one to serve as a work-room, and the third as a drying-room. There was a large steam-boiler in position that was used for steam-supply for the machinery run in this building during exhibitions, which (the boiler) was immediately put into working order, and gave ample quantity of steam. A reserve supply-tank was provided for water-use of this boiler by connecting a number of barrels together as described, from which the boiler was supplied by means of an injector. The wash-tubs used were the ordinary large-sized factory-made wooden wash-tubs, fifteen in number, set in position on rough wooden stands, and the water laid on to them; waste-pipes run from them into a large tank made of barrels. Steam-pipes were fitted into the tubs, so that all clothing was boiled in them, which process, with the aid of suitable chemicals, would thoroughly disinfect the clothing. There were, of course, many more tubs provided, but on to fifteen only was water and steam laid direct. The water and waste supply call for no special notice. The steam was supplied by means of a $\frac{3}{4}$ -inch iron pipe bent to the shape of the tub, and encircling about two-thirds of the diameter, the pipe being pierced with small holes. See sketch Fig. 5.

The drying-room was provided with two large self-feeding stoves and fitted up with metallic lines for hanging clothes upon.

The comfort of the patients was also provided for by the placing in suitable apartments throughout the wards of "Heep's Pat." automatic earth-closets. They were placed in ample numbers throughout the wards. The incinerator was used for drying the earth for them and disinfecting that already used. A quantity of bone-charcoal was also provided to mix with the earth, in the proportion of $\frac{1}{10}$ charcoal to $\frac{9}{10}$ earth. The closets were arranged with the

improved urine-separator, the solid matter falling into one receptacle, the urine into another.

The very important questions of heating and ventilating were solved in the manner I will attempt to describe in the next paragraph.

Steam was first suggested as a means of heating the wards. To this I immediately objected, considering it, under the circumstances, unsuitable: (1) Because it would necessarily require a complicated apparatus to heat so many buildings, and, from the nature of the disease, there would be difficulty in providing suitable skilled attendance for such an apparatus; (2) the liability of neglect's allowing steam-pipes to freeze; (3) the time it would take to prepare and set up a steam apparatus of sufficient power and effectiveness to do the heating and ventilating; (4) because I much preferred a number of open fires as providing a very effective means of extracting and disinfecting the contaminated air of the wards. The same fires that would heat the wards would also ventilate them in the most effective manner. There were seventy-five large-sized self-feeding stoves provided and fitted up. They were not spared in any way, it being the intention to have a reserve stock of stoves in each ward, ready for lighting, should the temperature or ventilation of the wards demand it. Some thousands of lengths of stove-pipe were required in the fitting of the stoves, which also added very much to the effectiveness of the heating. The buildings being without chimneys, it was necessary to build them, and twenty-three were erected in such a way as not to injure the buildings. To be safe from fire and meet the views of the insurance corps, they were made of such materials and in such a manner as to permit of their rapid construction. In each ward six of the heating stoves had heating coils fitting into the fire-pots, which were connected with barrels set on iron pipe-stands alongside of the stoves. The barrels were supplied with ball-cocks and tanks for automatic filling, and suitable draw-off cocks—some sixteen of these in all—were provided, and gave an ample supply of hot water for the use of the wards. The fresh air was introduced into the wards from outside through wooden shafts extending from each side one-third of the way into the centre of the wards, where the ends were provided with movable slides for regulating the supply. In the ceilings of the wards were provided a number of movable hatches about three feet square, suitably arranged with ropes and pulleys for opening or closing them, thus throwing into the ward the whole of the very large attic space. In the buildings having side windows in the attic, a number of the windows were arranged to be worked by cord and pulley from the ward, so that they could be opened and closed as desired. In this way the fresh air was let in from outside at the floor-level and at foot of beds, was warmed by the large number of stoves, ascended as it became heated, and passed out through ceiling openings into attic, from whence it was swept by the current produced from open windows at opposite sides. One of the buildings had no side windows, but a large and high central tower. The inlet and ceiling arrangement were the same in the wards in this building as above described, but an opening was made in top of the large tower, arranged with suitable cords, to be operated from the ward. A third building having neither windows nor tower, special shafts were conducted through its roof. There were some doubts as to the effectiveness of the ventilation, but I reasoned that if there was ample inlet for fresh air, and an abundance of power to heat it thoroughly, it would pass off rapidly from the top openings if suitably arranged. My ideas have proved correct, as when the Visiting Board of City Physicians inspected the wards—which they did periodically—they invariably found the heating and ventilation all they desired, and in their recent report they have again spoken of the entire absence of odor and unpleasantness, and of the warmth and freshness of the atmosphere of the wards. At any rate, it was the best that could be done under the circumstances and in the time, and had it turned out less effective there would be no reason for censure. The sketches will make the method of carrying out the work more easily understood.

A was a water-pipe supplying water to a ball-cock fitted in a small galvanized-iron tank B, which was secured with screws to the barrel C, which was fitted with a cover, D. The cold water was supplied from the tank B to the bottom of the barrel C by means of the pipe E. F was a stand supporting a barrel made of iron pipe and secured to the floor by flanges and screws. G was a return-pipe from the barrel connecting with the coil I, of $1\frac{1}{4}$ -inch pipe fitted around the top of the fire-pot of the stove. H was the

flow-pipe from the coil to the barrel. These pipes were brought out of the stove through the openings left for mica, which was replaced in the panel used with sheet-iron. By so doing the stoves were not injured. K is the fire-pot of

also fitted hose-cocks and a supply of hose to be used in case of fire and for general purposes.

To recapitulate: Seventy-five stoves were provided and fitted up, twenty-nine chimneys built, nine baths fitted,

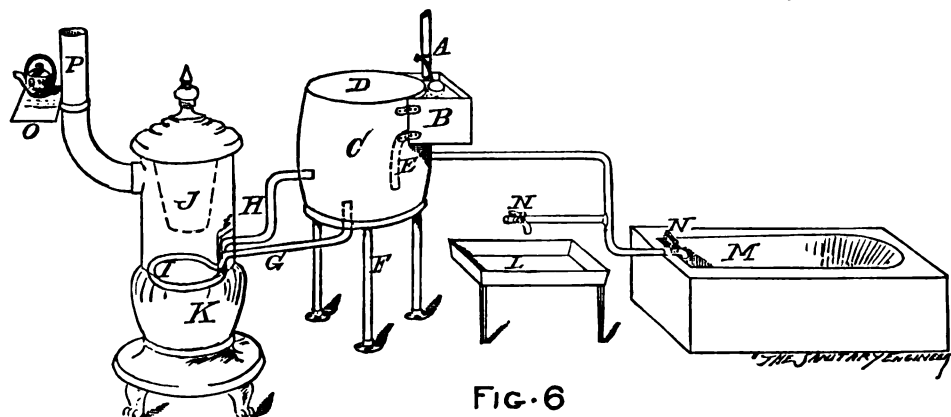


FIG. 6

SKETCH SHOWING THE METHOD OF ARRANGING THE STOVES THAT WERE USED FOR SUPPLYING HOT WATER AS WELL AS FOR HEATING.

the stove, L the sink, M the bath, N N cocks to supply water to same. Besides the arrangement as shown for supplying sinks and baths, there were a number of stoves fitted as shown, having only a barrel with a cock in it so that hot water might be drawn at the different places throughout the wards. P is a smoke-pipe of 7-inch sheet-iron, which was fitted at each stove with two shelves O secured to the pipe by means of hoop-iron bands and bolts, so that vessels could be placed on them to keep food, etc., warm. A number of the stoves also had extension-backs with pot-holes for the same purpose. J shows the feed-tube, K the fire-pot.

It will now be in order to describe the method of arranging the chimneys. They were made of 6-inch, 9-inch, 12-inch, Scotch salt-glazed tile pipes. The 6-inch took one stove, 9-inch two stoves, and 12-inch four stoves, as was required. This sketch will also serve to show the means of ventilating adopted.

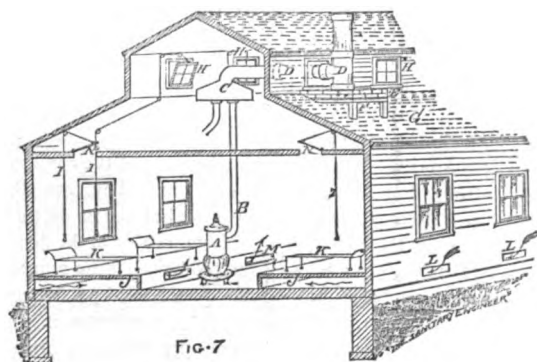


FIG. 7

A is the stove, B pipe from same ending in an enlarged metal pipe C to receive two to four stoves as required; D D is the tile-pipe chimney set on a strong wooden platform F, supported on the slope of roof G. This platform was covered with brick E, and on it was set a T or junction-pipe, with a line of pipe extending from it through the windows H into the attic over the ward where it received the metal pipe C. The tile pipe was carried up outside above the height of the central part of the roof, so as to secure good draught. All pipes were kept well away from wood-work, which was also protected by being lined with heavy tinned iron. K K shows beds which were raised from the floor on platforms that extended the length of the wards; these platforms were about eight inches from main floor. Under these platforms were fitted wooden shafts J J, by means of which cold fresh air entered from openings L L from outside the building. The ends of these shafts were closed with slides M. N N show hinged doors made in the ceiling of the ward and operated by means of rope and pulleys I. H shows windows along the side of the attic over the ward, which are opened and closed by means of ropes and pulleys operated from wards, as shown. In some of the private wards the old-fashioned syphon ventilators were fitted. The ventilating and heating of all the wards was arranged to work on similar principles, except that in wards not having the same form of roof and windows, H, the existing towers were used as outlets, or special shafts were constructed. Where there were no windows the chimneys were made on same plan, except that they were supported on the ceilings of wards on wood and brick platforms, and holes were cut through the roof for their exit. In each ward there were

eleven sinks, sixteen sewage-collecting tanks, one incinerator fitted up, twelve stoves fitted with hot-water attachment, four ranges fitted up and hot-water attachments provided, twenty-five earth-closets provided and set, two steam-boilers fitted up, fifteen wash-tubs, one steam-engine with dynamos and wires, and lamps put in operation, and one pump set, besides all the work called for in the various departments.

In addition to the hospitals the committee had fitted up in the different quarters of the city receiving or detaining houses for people to wait in a few hours while their houses were being fumigated and disinfected, the plan carried out being to at once remove to hospital any one sick with small-pox, and to immediately disinfect the dwelling from which they were removed. In order to prevent the well members of any household from going into the homes of their neighbors while this was being done, these detaining-houses were fitted with stoves and apparatus for making tea and coffee, baths with hot and cold water, and a disinfecting-machine in which clothing worn was placed. To enable this to be done the detaining-houses were fitted up in separate parts for male and female waiters, and suits of clothing provided, to be worn while their ordinary clothing was being fumigated. The method of disinfecting adopted for this was to keep the clothing at a temperature of 250° or over for a considerable time. The arrangement I fitted up was made as follows: An old building in the rear of the detaining-house had a portion of the first floor removed, and on the ground floor was set a powerful heating-stove. This was inclosed in a sheet-iron casing that extended through the flooring into the second story, and from the second story the clothing was hung in the before-mentioned chamber, where it remained subject to the heat and chemicals until thoroughly disinfected, when it was returned to the owners, who had during the interval taken a bath. See the sketch of disinfector, Fig. 8.

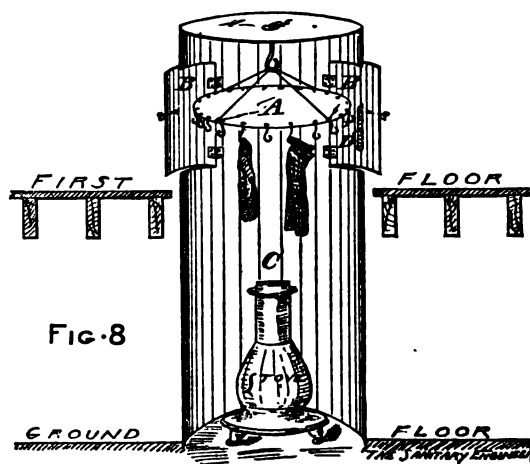


FIG. 8

A, iron rack revolving on central support and fitted with hooks to which were hung clothing; B, doors; C, iron casing; D, thermometer let into side of the casing and covered with plate-glass.

The patients were conveyed to the hospital in suitably arranged vans, fitted up with stoves and made comfortable, and were in charge of a driver and an attendant who rode behind at the door. The latter officer was appointed

to prevent the escape of patients, as once, on the van arriving at the hospital, the patient was not inside, having by some means escaped when on the way. There were also a number of carriages set apart for the special conveyance of patients who objected to go in the city vans. A number of undertakers were also licensed to do the burying, in hearses specially set apart for the conveyance of those having died of small-pox, and no followers were allowed.

The authorities also imported a disinfecting-apparatus for use at the hospital.

When it was found that patients or their friends objected to removal to hospital, they were allowed to remain at home, provided the health officer considered it possible to effectually isolate them. The doors of such houses were sealed, and sanitary police placed on guard outside to prevent any but those specially authorized from entering or coming out of such houses, and food and attendance was provided by the authorities. Such houses were also placarded, a large black and yellow poster showing the words, "Small-pox," "Piccolotte," being stuck upon the house, and many were the rows and much the trouble into which the placarders got, most people in certain quarters strongly objecting to the placarding of their houses. Vaccinating-stations were opened in all quarters of the city, where the operation was performed free. There were also a number of doctors employed who went from house to house vaccinating; relief boards and offices were also opened in certain quarters for the relief of the families of those whose bread-winners might be in hospital. The latter measure greatly helped the committee by their efforts to get patients into the hospital, as relief was not afforded unless patients were in the hospital. The most effective agency in securing vaccination was the co-operation of the employers of labor, most of whom made it a question of no vaccination no work. Special medical officers also watched all trains and steamboats to prevent those ill with the disease escaping from the city and so spreading the disease. At time of writing this part of the work has been reversed, the authorities being employed in quarantining one of the outlying suburbs not under city control, the rulers of which having failed to comply with orders of Central Board of Health as regards vaccination, isolation, etc., the city authorities determined the inhabitants of this suburb should not enter the city except under certain special conditions, and are engaged in fencing of the streets at city limits, placing strong guards of police, etc., but there are indications that the delinquent authorities will capitulate and adopt the measures required. At one time serious riots were threatened, the mob threatening the police and workmen who were erecting the fences.

A complete history of the small-pox plague would not be suitable for your columns, but, if it is ever written, it will prove very interesting. The one thing remarkable to my mind was the entire absence of anything like panic or dread of the disease on the part of the inhabitants. Nearly all the excitement was against measures adopted for the abatement of the plague. An anti-vaccination league was formed, a paper, the "Anti-Vaccinator," published, and many other means adopted to hinder the authorities, some of whose officers, I am afraid, were only half-hearted in their efforts. Songs were sung about small-pox, stories told, and jokes perpetrated by many thoughtless or reckless people, and no stranger would suspect that a serious epidemic was devastating the inhabitants. I cannot conclude without acknowledging my deep obligation to Mr. J. R. Prowse, who was a member of the citizens' committee and who volunteered to specially assist me, which he did in his usual common-sense and energetic manner. As far as known to date the deaths have been between 4,000 and 5,000. The work of preparing the hospital took ten days.

Montreal, September, 1886.

J. W. HUGHES.

THE editor of the Toledo, O., *Blade* began putting the cinders and ashes from the furnaces under his boilers on the roadway in front of his premises, of 200 feet frontage, in the summer of 1885. The street was covered to the depth of six inches. The experiment has proved so satisfactory that the Mayor of the city has recommended to the Street Committee to have unpaved streets generally covered in that way. The *Blade* says that the cinder covering "became remarkably compact, and formed so good a roadway that the most heavily loaded wagons did not cut through it even during the open weather of the past winter. During the dry period this summer it did not become nearly so dusty as the ordinary earth roadways.

THE NEW YORK ELEVATED RAILROAD STRUCTURE.

THE patrons of the elevated railways are, no doubt, deeply interested to know that the structure on which they ride daily is sufficiently strong to endure the strain to which it is subjected, and to that end I beg you to insert this communication, embodying a few facts, in reply to your editorial of 14th inst. headed "The Elevated Railways."

The "L" lines consist of thirty-two miles of structure, all of which is double track. They are divided into spans about forty feet long, each span being independent, and the ends of the girders resting upon transverse girders supported by wrought-iron columns, in one type of construction, the girders resting directly upon the columns.

The material is the best refined iron for bridge purposes, and has a tensile strength of not less than 50,000 pounds per square inch, the Rapid Transit act requiring that the strains on the compression and tension members be limited to 9,000 pounds per square inch, the shearing strain on the rivets to be not more than 7,000 pounds per square inch, a maximum deflection of the girders to be not greater than 1-1,500 of its length, the columns so proportioned as to have a factor of safety of 5, and the foundations not to have a greater weight come upon them than 2,000 pounds to the square foot.

With the increased weight of the engines now in use, necessary to draw five loaded cars, in no case is any portion of the structure strained anywhere near the limit above referred to.

In a series of experiments made by the eminent English engineer, Fairbairn, he concluded that a light plate-girder of 20 feet span, if subjected to 100 daily deflections equal to one-quarter of its breaking load, would last 300 years. Now, our structure having a factor of safety from six to ten, the latter on Second Avenue, what may we expect as to the life of the "L" roads? Surely not so serious a condition of things as set forth in your editorial.

We have during the past four years re-enforced the Sixth Avenue pin-connected structure so as to keep up the high factor of safety required by our charter and fit it for the type of engines now in use. The Third Avenue line is undergoing the same additions, three-fourths of the work being completed. The Second Avenue line is designed for engines much heavier than those we are now using.

The elevated structures cannot consistently be compared with iron bridges of surface roads.

1. The spans of our structure are small in comparison.
2. The trains are much lighter.
3. The engines less than one-half as heavy.
4. The speed is from one-half to one-third less than on surface bridges.
5. A long train causes no greater strain than a short one, because one car only, or an engine and part of a car, can be upon a pair of girders or bridge at a time, no matter how long the train.

Pieces of iron taken out of the structure recently and carefully tested show that no deterioration has taken place.

A board of eminent engineering experts and builders of iron bridges made a thorough investigation, March, 1885, and reported that the structure was in better condition at the time than when first opened for business. Associated with these gentlemen was Prof. Thurston, of Stevens Institute of Technology, now connected with the scientific department of Cornell University, who made tests of the iron, and reported that there were no signs of crystallization, and was surprised at the uniform good quality of the iron submitted to him for testing.

A large and efficient force of men is employed by the company night and day to inspect the track and structure. Constant improvements are being made to relieve the structure from undue shocks, such as replacing fifty and fifty-six pound rail with steel rail weighing seventy pounds per yard, and the best devices for rail joints are being tested.—F. K. HAIN in *New York Sun*.

NEW YORK, October 18.

MEDICAL INSPECTOR TAYLOR reports to the Board of Health of Philadelphia that he has investigated the sanitary condition of all the school-houses in the city and finds that twenty-three are so bad that they should be closed.

THERE were 222 deaths in Milwaukee in October; 56 of these were scarlet fever cases, with two deaths; 66 diphtheria cases and 24 deaths.

Correspondence.

EXPLOSION OF GRAVESEND WATER-TOWER.

BOSTON, October 28, 1886.

SIR: In your issue of the 23d inst. you have an article concerning the bursting of the Gravesend water-tower. As no facts were given by me it is apparent that all the information (except the admitted and apparent fall of the structure) must have come from the only other person who was acquainted with them—viz., the hydraulic engineer, who was at the same time the designer of the stand-pipe, the originator of the specifications, and the contractor who was to supply the Kings County Water-Supply Company with a complete plant. While you are aware from my note of the 20th that the specifications published in the article did not originate with me, no allusion was made to this fact, and the natural inference would be that I was the author.

I followed the specifications implicitly, and was repeatedly assured during the process of the work that it was satisfactory. Naturally enough, in furnishing you with the items for the article he did not allude to the real cause of the disaster.

This was repeatedly brought to his attention, and the possible danger was pointed out to him.

It is, as you say, a matter of much interest to engineers and the public, and the "rule-of-thumb" point is well taken.

When you come to see all of the correspondence regarding the strength of the tower you will see how it applies to the case in hand.

I still think, as I wrote you on the 20th, that it would have been better to wait till experts had gone carefully over the matter, taking into account the faulty design.

The engineers whom I sent out to examine the ruins have reported, and are satisfied that I carefully and scrupulously followed out the specifications, and that the disaster was in no sense due to any fault of mine, but as this report might be considered "*ex parte*," I preferred waiting till the matter could have been carefully considered by the parties most interested.

As the statement of the other side has been widely published, and as you can have no possible intention of misleading any one, I trust you will give this note a prominent place in your next issue.

As written you on the 20th, I shall be pleased to furnish you the whole correspondence (relating to strength of tower), and also detailed report of the examining engineers, when the proper time comes. I am yours,

H. S. ROBINSON.

[We would say in reply to the above that all of the data for the article on the bursting of the tower, published October 23, were collected by our own representative, and from actual measurements made by him on the ground after the catastrophe, and from photographs taken at the same time. No information whatever came from the "hydraulic engineer" referred to, other than the copy of the specifications furnished by him, which came to us after the article was in type.—ED. SAN. ENG.]

CEMENT PIPE FOR WATER-MAINS.

As a supplement to the reply we made to a question regarding this kind of pipe for water-mains in our last issue, we give the following opinions concerning it, received in response to inquiries for information:

OFFICE OF BRIDGEPORT HYDRAULIC CO.,
13 UNION SQUARE,
BRIDGEPORT, CONN., November 1, 1886.

SIR: The question of cement pipe has been presented to me several times, and each time I have said that the Phipps patent pipe, made of clear cement and laid with the same, is, in my opinion, the very best pipe for water-mains in use. Mr. Phipps laid over 6,000 feet of 20x24-inch pipe for us this season. I am now about to order more of smaller size. The attachments for house purposes are very readily made by soldering the faucet on first and then boring through. This may be done with ease, either with or without the pressure on the pipe. There are now connections on here made on a poorer cement pipe which have been on for over twenty-five years.

Very respectfully, GEORGE RICHARDSON, Sup't

BOSTON, November 1, 1886.

SIR: I am not sure that I am familiar with the cement-lined pipe made under the Phipps patent here referred to.

But I am familiar with this class of pipe, as it has been made and used in many cities for water-mains. In many cases it has given satisfaction for a term of about ten years, though often failing in a shorter time. We have yet to learn of a place where it has been in use for fifteen years without giving a great deal of trouble.

The cement lining, if carefully applied, is as nearly imperishable as the work of human hands can ever be expected to be, but this material is not adapted to resisting hydraulic pressure. Such pipe is for this reason always composed of a wrought-iron cylinder riveted up, and afterwards coated inside and outside with cement. This iron cylinder resists the bursting pressure so long as it remains sound, but no longer. The difficulty comes from the water getting at it here and there through minute cracks or pores in the course of time, and the consequent failure by rust. Wrought-iron is much more rapidly rusted than cast-iron, and is also thinner for equivalent strength when new. The result is the very general use of cast-iron for water-mains by all communities who desire a permanent article, and who can afford to pay for it. But in service-pipe for branches between the street-mains and the houses the case is different. The small size demanded enables us to use the ordinary lap-welded wrought-iron pipe with screw-joints, such as are used for the distribution of gas and steam.

When these are coated properly with hydraulic cement they become the very best water-service pipes in the world. Their thickness is such that they will not rust through from the outside unless laid in salt mud, while the cement lining, properly applied, is indestructible and never contaminates the water.

Respectfully,

E. S. PHILBRICK.

ON MOTION OF AN ELEVATOR.

NEW YORK, October 9, 1886.

SIR: Please favor a few of your readers with an answer to the following:

Suppose I suspend a cage with four men in it, traveling between guides on the sides to descend to a mine.

Suppose, again, I should use a propelling force from below to raise and lower the same cage, having rested my cage on a frame-work. Now, then, which ought to have the best motion for the men to travel in all day?

Would you kindly give us the scientific view of the matter, and please name some good book I could read up on the subject, and oblige, yours most respectfully,

J. D. THOMAS.

[Our correspondent does not state clearly what he desires to know. We judge it to be a question as to the comparative smoothness of motion of a cage lowered or hoisted by a rope to which it is suspended, or moved from below as by a hydraulic ram.

With properly constructed machinery, the slides, etc., to the cage well fitted, and reasonable care in stopping or starting, there ought to be no perceptible difference. Most of the hydraulic lifts thus far constructed have had a slower motion than the most recent passenger lifts of other kinds, and some persons find the quick motion disagreeable, but we know of no other cause of annoyance.

Cheap machinery or apparatus of any kind is not likely to be satisfactory, and we can well conceive that if a man had to risk all day in some of the elevators in use, he would get very tired of it. The accurate fitting of the slides is absolutely essential to smoothness of running.]

THE VENTILATION OF SHOW-WINDOWS.

TAUNTON, MASS., October 26, 1886.

SIR: Another solution of the problem of preventing the accumulation of watery vapor upon the inside of show-windows where gas is burned has been found in this city (see your issue of October 23, page 498), and consists in making the show-window a tight and separate compartment with reference to the interior of the store, and then admitting to the show-window an abundant supply of cold air through openings in the front wall just above the sidewalk, and providing a small outlet for the products of combustion overhead.

I am not prepared to discuss the *why* of this action, but the result in the two or three cases where I have seen it tried leaves nothing to be desired. Yours truly, W. R. B.

FINISH FOR WALLS AND CEILINGS OF HOSPITALS.

TORONTO, October 23, 1886.

SIR: Will you kindly state what, in your opinion, is the best method of finishing the plastered surfaces of walls and ceilings in a hospital for infectious diseases so that

they will be least absorbent and most capable of being readily disinfected? also, what kind of floor is best for such a building, whether hard wood oiled or varnished, or pine painted?

[The best finish for walls in such a hospital ward is probably a good sand finish, on which should be placed three coats of paint. This appears to be the least liable to cracks and scaling, and is readily cleansed and disinfected. The best floor is oak or heart pine, oiled. A painted floor is not satisfactory.]

GLAZING FOR CLAY DRAIN-PIPES.

MILTON, PA., October 27, 1886.

SIR: I have been directed by Dr. J. S. Billings, U. S. A., to you for information on the following: (1) What is the best kind of glazing for clay drain-pipes? (2) How long will it last? (3) The price? I shall be very much obliged for any information on this subject, and for reference to works or authors.

Very respectfully, W. F. MCK. RITTER.

[The best clay pipes for all purposes are undoubtedly the "salt-glazed" pipes; the other kinds being known as the "slip"-glazed. The best pipes from any reputable manufacturer are all that can be desired. As to prices, we would advise our correspondent sending to any of the firms advertising in our columns for a list. These lists are subject always to a discount to dealers and large users.]

CLEVELAND, O., CIVIL ENGINEERS' CLUB.

A SPECIAL meeting of the Civil Engineers' Club was held October 26. There was a large gathering to consider the report of the Committee on Railroad Engineering, which was presented by Mr. Augustus Mordecai, the chairman. The other members of the committee are: J. L. Sterling, J. C. Brewer, W. C. Jones, and L. C. Clark. After the reading of the report the evening was devoted to discussion. A paper on the subject of railroad engineering will be read at the meeting of the club on November 9.

THE Civil Engineers' Club of Worcester, Mass., at a meeting October 29, discussed the uses of concrete in building. The subject was discussed by Hon. Phineas Ball, City Engineer Allen, Gen. R. H. Chamberlain, and M. A. Boyden, Mr. Allen calling attention to the use of concrete in the foundation of the Statue of Liberty Enlightening the World, in New York Harbor.

THE American Society of Civil Engineers held its first meeting of the month on Wednesday evening.

The following gentlemen were elected as Members: Alexander Gordon Brinckerhoff (Stevens Institute, 1877), Engineer and Superintendent for Bates & Johnson Steam-Heating Co., of New York, Brooklyn, N. Y.; Chambers McKibbin Craig (Sheffield Sci. School, 1875), Principal Assistant Engineer of the Macon and Dublin Railroad, Jeffersonville, Geo.; Wilbur Fisk McClure, Engineer for the Mountain Water Co., Los Angeles, Cal.; William Lawrence Saunders (Univ. Penna., 1876), Engineer for the Ingersoll Rock-Drill Co., New York City; and the following as Juniors: Christopher Newton Brown, Assistant Professor Civil Engineering, Ohio State University; Elijah Polhill Butts, Assistant Engineer, Omaha Bridge, Omaha, Neb.

The paper of the evening was by Robert L. Harris, member of the society, on "Notes of a recent visit to the St. Lawrence Bridge, now being constructed at Lachine, Canada." The chief matter of interest in the paper was the remarkable speed at which the masonry has been built in a current of eight to nine miles per hour, one being in water forty feet deep. The whole has been built in a year, and the bridge will be finished before 1887.

Señor Gayol, City Engineer of Mexico, was then introduced, and gave an interesting description of the work progressing for the drainage of the city and valley, and the entire removal of Lake Zacatecos. A canal 30 miles long, 23 feet wide at base, with 1 foot grade per mile, will carry the water to the base of a ridge, which will be penetrated by a tunnel 12x13 feet internal section, 6 miles long, with grade of $1\frac{1}{2}$ per 1,000. The water after passing the ridge will be used for irrigation purposes.

Captain A. E. Piovkow, the representative of Herr Gruson, of Buckau, Germany, the manufacturer of the Gruson armor, was then introduced, and gave a description of the chilled cast armor, with which such remarkable results have been obtained in breaking up the heaviest projectiles discharged against it.

Gas and Electricity.

Illuminating Power of Gas in New York City.

Week ending	New York Gas-Light Company.	Manhattan Gas-Light Company.	Metropolitan Gas-Light Company.	Mutual Gas-Light Company.	Municipal Gas-Light Company.	Krickerbocker Gas-Light Company.	Equitable Gas-Light Company.
October 30	25.47	21.02	21.24	29.04	28.81	22.06	31.25

E. G. LOVE, Ph.D., Gas Examiner.

MEETING OF THE AMERICAN GAS-LIGHT ASSOCIATION.

THE fourteenth annual meeting of the American Gas-Light Association was held in Philadelphia on October 20, 21, and 22. The President, Mr. A. C. Wood, of Syracuse, in his address, said that whenever a gas company conducts its business in an arbitrary and unjust manner, charging exorbitant prices and paying large dividends, it affects the whole trade. A large portion of the prejudice against gas companies arises from this short-sighted and illiberal policy. We need protection from bogus companies who lay mains for a short distance, leaving streets torn up, and then sell out to the original company of the town. The way to meet these speculating raiders is to popularize companies in various ways and cheapen the price as rapidly as possible.

Among the papers presented was one on "Condensation," by R. B. Taber, of New Bedford, and one on "The Hydraulic Main," by F. W. Floyd, of this city. "Gas Commissions" was the title of a paper by G. G. Ramsdell, of Vincennes, Ind., in which the author strongly favored the establishment of such commissions in the different States. The association, however, was not prepared to endorse this opinion, as a resolution to that effect which was offered was referred to the Executive Committee to be reported on at the next meeting.

The subject of "Natural-Gas" was presented by W. H. Denniston, of Pittsburg; and W. W. Goodwin, of Philadelphia, gave some interesting statistics of the gas companies of the United States and Canada.

"A New Departure in Gas-holder Houses" was the subject of a paper by W. H. White, of this city; and A. B. Slater, of Providence, read a paper on "Three-Hour Charges." A. E. Boardman, of Macon, Geo., presented some "Suggestions upon Candle-Power and Illumination." The Secretary read a paper prepared by J. H. Armington, of Brooklyn, on "Some Suggestions upon Paper-Writing," in which the author attacked the practice of some gas companies of publishing the "secrets of the business" relative to costs, profits, etc. It is just the spirit shown in this paper which is largely responsible for the unpleasant feeling existing in many communities between the gas company and the consumer, and we are glad to see that the paper met with much severe criticism at the hands of the association.

Mr. M. S. Greenough, of Boston, was elected president for the coming year, and it was decided to hold the next meeting in this city.

A PROPOSITION for leasing the Philadelphia gas-works was made to councils, October 21, by the United Gas Improvement Company, which proposes to pay annually, as rent, so long as the price of gas shall be a net price of \$1.50 per thousand cubic feet, $33\frac{1}{3}$ per cent. of the gross receipts from its sales of gas to private consumers, which it will guarantee will not in any one year be less than the sum of \$1,250,000, and expend, as required, at least \$3,000,000 for improvements.

NEW YORK ARCHITECTURAL LEAGUE.

THE regular meeting of the Architectural League of New York City was held on the evening of November 3. Mr. H. O. Avery presided, and about twenty sat down to dinner. The Committee on Current Work reported that arrangements had been made with the Salmagundi Sketch Club to hold a joint exhibition. There was considerable discussion on the subject, after which the following jury was elected for the exhibition: Richard M. Hunt, Stanford White, A. W. Drake, R. H. Robertson, J. Dufais, E. M. Wheelwright, and Treadwell. The following gentlemen were appointed as a Catalogue and Reception Committee: H. O. Avery, G. A. Glaenzer, E. P. Welch.

INTERSTATE NOTIFICATION IN INFECTIOUS AND CONTAGIOUS DISEASES.

THE following resolutions, presented by the National Conference of State Boards of Health, were adopted by the American Public Health Association at Toronto, October 8, 1886:

Whereas, It is necessary for the protection and preservation of the public health that prompt information should be given of the existence of cholera, yellow fever, and small-pox; be it

Resolved, That it is the sense of the National Conference of State Boards of Health that it is the duty of each State, Provincial, and Local Board of Health, in any locality in which said diseases may at any time occur, to furnish immediately information of the existence of such disease to boards of health of neighboring and provincial States, and to the local board in such States as have no State board.

Resolved, That upon rumor or report of the existence of pestilential disease, and positive definite information thereon not being obtainable from the proper health authorities, this conference recommends that the health officials of one State shall be privileged and justified to go into another State for the purpose of investigating and establishing the truth or falsity of such reports.

Resolved, That whenever practicable, the investigations made under the preceding section shall be done with the co-operation of the State or local health authorities.

Resolved, That any case which presents symptoms seriously suspicious of one of the aforementioned diseases shall be treated as suspicious, and reported as provided for in cases announced as actual.

Resolved, That any case respecting which reputable and experienced physicians disagree as to whether the disease is or is not pestilential shall be reported as suspicious.

Resolved, That any case respecting which efforts are made to conceal its existence, full history, and true nature, shall be deemed suspicious, and so acted upon.

Resolved, That in accordance with the provisions of the foregoing resolutions, the boards of health of the United States and Canada, represented at this conference, do pledge themselves to an interchange of information as herein provided.

IRVING A. WATSON,

Secretary American Public Health Association.

A CONVICTION FOR VIOLATING THE NEW YORK PLUMBING LAW.

JAMES HARMON, a plumber of East One Hundred and Fourteenth Street, in this city, was last week sentenced in the Court of Special Sessions to two months' imprisonment for violating the plumbing law. The building in which the work was done was a factory on Grand Street employing a large number of hands. Inspection was made and Harmon was notified that he had not put in vent-pipes as the plumbing law requires. Then, after a time, he pretended that the required alterations had been made, and took on a blustering tone, not anticipating that a thorough investigation would be made by which his knavery would be exposed. The second inspection, however, when floors were torn up, revealed the fact that Harmon had put in mere dummies for vent-pipes, the lower ends of the pipes being simply run into the dirt underneath the floors. A warrant was issued for Harmon's arrest, but for two months he could not be found, and it was believed he had joined the American colony in Canada. On his return he was arrested, put on trial, convicted, and sentenced—the first case where a violation of the law has been followed by imprisonment, though fines have been imposed in several instances.

WHEN the President of the Board of Health of Detroit, transmitting his report to the Common Council, called attention to "the present and future sanitary needs of the city," it must have puzzled the honorable councilmen a little to discover wherein the needs are set forth, for the report consists merely of a series of statistical tables prepared by the Health Officer, Dr. O. W. Wight, and forwarded by him without comment. It is true that one might easily infer from the fact that during the year out of 3,386 deaths 295 were due to diphtheria, 44 to typhoid fever, 119 to scarlet fever, and 333 to consumption. There is room for improvement in the sanitary condition of the city, but beyond that there is little to be learned from this report.

For Contracting Intelligence, see Supplement.

PERSONAL.

THE death of George Godwin, until a few years since editor of *London Builder*, is reported. Mr. Godwin had the distinction of building up his journal to become probably the first architectural periodical in the world. Among the subjects which he took a deep personal interest in was the improvement of the dwellings of the poor tenement-house population, and this led to his appointment in 1884 as a member of the Royal Commission for improving the homes of the working classes, whose very able reports were noticed at length in our issues of September and October, 1885. At his death Mr. Godwin was in his seventy-second year. On his retiring from the editorship of the *Builder* he was succeeded by Mr. Statham.

MESSRS. JOSEPH P. DAVIS, of New York, Rudolph Hering, of Chicago, and Robert Moore, of St. Louis, have been appointed by the President of the American Society of Civil Engineers, on the request of city of Providence, a committee to examine and report on the plans of Mr. Samuel M. Gray, City Engineer, for the sewerage of that city. They have this week visited Providence in connection with the matter.

COMMANDER B. F. CHANDLER, U. S. N., on the retired list, died at Onset, Mass., October 31, of apoplexy. He was aged 70 years. Commander Chandler was for many years connected with the navy yards at Portsmouth, Charleston, and New London.

MR. PATRICK REILLY, ex-Water Commissioner of Jersey City, N. J., died October 31, in Jersey City. Coming to this country an Irish lad without means, he died in possession of a fortune, acquired by frugality and business shrewdness.

RUFUS SARGENT, of Newburyport, Mass., died on November 1, at Palatka, Fla., where he was engaged on the construction of buildings for a railroad company.

NEW CATALOGUES.

We have received from Messrs. Stambach & Love, 52 North Seventh Street, Philadelphia, a handsomely printed catalogue illustrating plumbers' supplies and sanitary specialties manufactured and dealt in by this firm; also the soap-stone manufactures of the Philadelphia Soap-Stone Works, of which they are the proprietors.

Building Intelligence.

We solicit from each and every one of our readers information relating to projected buildings in their locality, and should be glad to receive newspaper clippings and other items of interest.

ABBREVIATIONS.—*b*, brown stone; *br*, brick; *br st*, brick store; *bs dwll*, brown-stone dwelling; *apart house*, apartment-house; *ten*, tenement; *a*, each s. owner; *ar*, architect; *b*, builder; *fr*, frame.

NEW YORK CITY.

101 Norfolk st, 5-story br ten; cost, \$18,000; o, Charles and August Ruff, 48 Norfolk st; a, Charles Rentz.

St. Georges Pl, w s, abt 75 n 11th st, 5-story br bldg; cost, \$12,000; o, Elias Wolff, 298 E. Houston st; a, Charles Rentz.

324 E 29th st, 5-story br ten; cost, \$18,000; o, Robert Huson, 218 E 15th st; a, J. Kastner.

763 10th av, 5-story br ten; cost, \$18,000; o, Wm. Muller, 761 10th av; a, James W. Cole; b, John Jordan.

304 E 47th st, 4-story br (stone front) dwell; cost, \$10,000; o, Church of St. Boniface, Matthew Nickol, pastor, 307 E 47th st; a, Frederick Jenth; b, not selected.

89th st, s s, 200 e 2d av, 2 5-story br tens; cost, each, \$13,000; o, Peter J. Uihlein, 355 E 87th st; a, John Brandt.

1st av, s e cor 91st st, 2 5-story br tens; cost, \$20,000 and \$18,000; o, Mathias H. Schneider, 165 E 105th st; a, Berger & Baylies.

91st st, s s, 74 e 1st av, 5-story br ten; cost, \$10,000; o, Mathias Schneider, 165 E 105th st; a, Berger & Baylies.

2d av, s e cor 83d st, 5-story br ten; cost, \$18,500; o, George and John Schreiner, Jr., 348 E 82d st; a, John Brandt.

2d av, e s, 28 s 83d st, 2 5-story br tens; cost, each, \$12,500; o and a, same as last.

2d av, e s, 78 s 83d st, 2 5-story br tens; cost, each, \$18,500; o and a, same as last.

83d st, s s, 75 e 2d av, 5-story br ten; cost, \$12,500; o, same as last.

313 W 60th st, 5-story br flat; cost, \$20,000; o, Travers Bros., 334-336 W 60th st; a and b, Geo. W. Hughes.

95th st, n s, 150 w 9th av, 6 4-story br dwells; cost, each, \$12,000; o, Wm. S. Jennings, 52 East 122d st; a, Charles Baxter.

6th av, n e cor 124th st, 5-story br (st front) flat; cost, \$18,000; o, John Livingston, 130 E 71st st; a, F. T. Camp.

6th av, e s, 19 n 124th st, 3 5-story br flats with stores; cost, each, \$16,000; o and a, same as last.

6th av, e s, 76 n 124th st, 5-story br (stone front) flat with store; cost, \$18,000; o and a, same as last.

124th st, n s, 75 e 6th av, 5-story br (stone front) flat; cost, \$15,000; o and a, same as last.

159th st, s s, 275 w 10th av, 4-story br ten; cost, \$11,000; o, Elizabeth Roberts, 156th st and 10th av; a, J. F. Burrows.

6th av, s w cor 132d st, 5-story br flat with store; cost, \$18,000; o, Franklin A. Thurston, 62 East 133d st; a, R. S. Townsend; b, not selected.

10th av, n e cor 153d st, 5-story br ten; cost, \$20,000; o, Joseph McGuire, 122 E 58th st; a, John Brandt.

10th av, e s, 24.11 n 153d st, 3 5-story br tens; cost, each, \$18,500; o and a, same as last.

184th st, n s, abt 140 e Sedgwick av, 2-story and attic frame dwell; cost, \$6,000; o, William D. Peck, 1647 4th av; a, J. C. Cady & Co.; b, C. Folin & Son.

Clifton st, s w cor Tinton av and Clifton st, s s, 30 w Tinton av, 2 3-story fr dwells; cost, each, \$3,800; o, a and b, John W. Decker, 841 Forest av.

149th st, n s, 200 e Courtlandt av, 4-story br ten; cost, \$10,000; o, Theodore Wegener, 551 E 151st st; a, Adolph Pfeiffer.

149th st, n s, 225 e Courtlandt av, 4-story br ten; cost, \$12,000; o, Mary Kelly, 538 E 149th st; a, M. J. Garvin; b, Theodore Wegener and Geo. Mand.

155th st, n s, 150 e Courtlandt av, 3-story br ten; cost, \$9,000; o, Max Schmeckenberger, 616 East 156th st; a, M. J. Garvin; b, not selected.

184th st, n s, abt 90 e Sedgwick av, 2-story and attic frame dwell; cost, \$6,000; o, Horace W. Fowler, Orange, N. J.; a, J. C. Cady & Co.; b, C. V. Folin & Son.

519-21 W 28th st, 2 br flats and stores; cost, \$30,000; o, R. McArtrey; a, J. D. Hatch.

2d av, e s, 54 ft s 72d st, br dwell and store; cost, \$8,000; o, Maria Moore; a, Marshall Walker; b, John Maxwell.

42-46 8th st, and 1043-47 Madison av, 6 br dwells; cost, \$140,000; o, Thos. Graham and others; a, Chas. Graham & Sons.

(Continued on Supplement.)

New Advertisements.

W. & J. SLOANE, New York. Carpets. P. 533.

J. N. RAYMOND, Chicago, Ill. Sash-Weights. P. 534.

A. ALLER, New York. Duplex Steam-Pumps. P. 536.

KNOWLES STEAM-PUMP WORKS, New York and Boston. Pumping Machinery. P. 536.

PROPOSALS. P. 537-538.

E. A. JACKSON & BRO., New York. Heat-Saving and Ventilating Grate. P. 538.

U. S. MINERAL WOOL CO., New York. Mineral Wool. P. 549.

PANCAST & MAULE, Philadelphia, Pa. Hand Pipe-Cutting Machine. P. 550.

KELLY & JONES CO., New York. Steam-Heating Specialties. P. 550.

NATIONAL ELECTRIC-SERVICE CO., New York, Chicago, and Boston. Heat-Regulating Apparatus. P. 552.

THE J. L. MOTT IRON-WORKS, New York and Chicago. Sanitary Specialties. P. 554.

HAINES, JONES & CADBURY, Philadelphia. Bennot Bath-Tub Trap. P. 554.

THE MEYER-SNIFFEN CO. (Limited), New York, Boston, and Chicago. Sanitary Specialties. P. 555.

ANNOUNCEMENT.

The publication of the sixth revised edition of the U. S. Pharmacopoeia (1880), containing as it does more strict requirements for the purity and strength of pharmaceutical preparations, has been followed in some States of the Union by the enactment of laws against the adulteration of drugs, which laws make the Pharmacopoeia the official standard.

In accordance with our established policy we shall, as in the past, use our best endeavors to furnish only such preparations as shall meet pharmacopoeial requirements. We are heartily in sympathy with all efforts which aim to improve the quality of medicines, and shall continue as heretofore to exclude all low grade and inferior articles and to use our influence to promote the sale and use of pure drugs and medical preparations.

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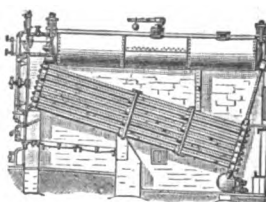
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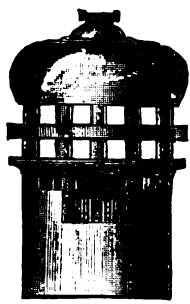
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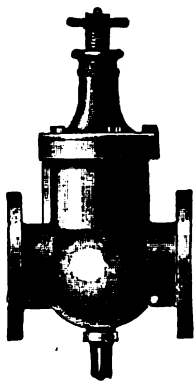
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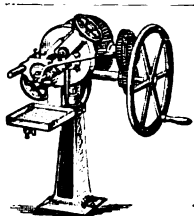


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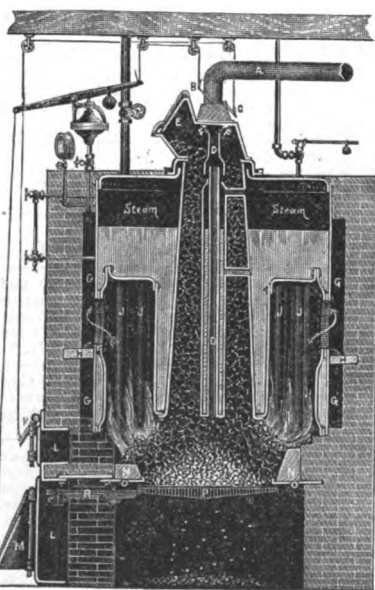
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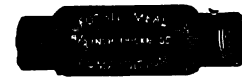
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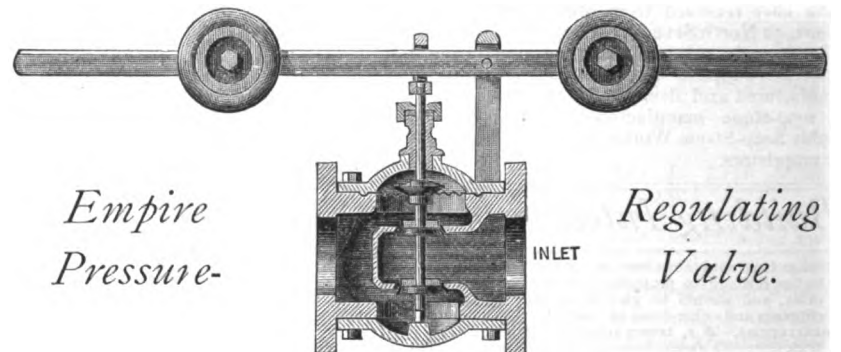
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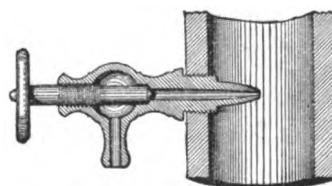
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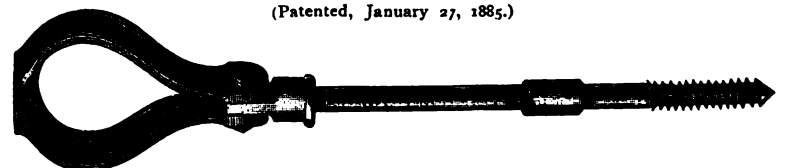
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TRADE SCHOOLS.

WE advise our readers to read an article on the "Need of Trade-Schools," by Mr. Richard T. Auchmuty, the philanthropic founder of the New York Trade-Schools, which appears in the November issue of the *Century Magazine*. Every American who loves his country and has consideration for the welfare of its industrial classes cannot fail to be interested in this plea on behalf of American-born boys, and especially should every mechanic that has a child born in this country read and carefully consider the arguments presented by Mr. Auchmuty. This article suggests a fact which should not be lost sight of—namely, that, except possibly in a few of our largest cities, the demand for skilled mechanics is far in excess of the supply, and this is likely to be the case for many years to come. As professional men are educated in our large cities to carry on their practice in younger communities, so must it be with our mechanics, and the leaders of our trades unions should not allow the ideas of men recently arrived from old and built-up foreign communities to influence them to take narrow views of this important question, since the conditions existing in the United States with regard to prospective work and remunerative employment for good mechanics are not to be compared with those of communities that have long since passed the period of development.

POLLUTION OF THE RIVER LEA.

THE complications and difficulties which arise in connection with a stream flowing through a thickly-settled country, more especially when this stream is made the source of water-supply of a large city, are well illustrated in the evidence given before the committee on the pollution of the River Lea in England, which has been recently published.

The River Lea is under the direction of a board of trustees, who are to improve the navigation and dispose of surplus water. Two of the companies which supply London with water—namely, the New River Company and the East London Water-Works Company—derive a part of their supply from this river, and for the past year or two have taken so much water from it in dry times as to so reduce the stream that it became exceedingly foul from sewage poured into it from towns and villages along its banks. That the nuisance thus produced was largely due to the neglect of the trustees to enforce their rights is clear, for they have a paramount right to a sufficient amount to keep the stream fairly flushed, and this they have not enforced. This is, however, merely a temporary and secondary matter as compared with the main questions which the committee were expected to consider, but upon which they seem to have found it impossible to come to any decision. These questions were whether the towns upon the Lea should be allowed to discharge their sewage effluents into it under any conditions as to purification, etc., and if so what conditions; or, if no sewage effluents are to be permitted to pass into the river, what disposition shall be made of the sewage of these towns.

All, or nearly all, of these towns now have some process of precipitation, irrigation, etc., but the results are evidently not satisfactory. Of course, the advocates of each process, whether patented or not, are prepared to show that by their method

they can take the sewage of a town and deliver from it an effluent which, if not actually purer and better than spring-water, will not at all contaminate the river or make its waters unfit for domestic use; but the engineers prefer the old plan of a conjoint intercepting sewer which shall collect from all the towns and discharge into the Thames so far below London as to produce no difficulty. For example, Sir Joseph Bazalgette stated that he had considered the question twenty years ago, and had become satisfied that the populous and detached towns on the north and east of London, which have their natural outfall for drainage in the River Lea, could not obtain effectual and economical disposal of their sewage except by embracing the whole under one comprehensive system. He prepared a plan at that time, and subsequently, in 1882, prepared an amended plan, which was approved by most of the local boards concerned, but nothing came of it. This plan provided for the creation by Act of Parliament of a drainage-area to include all the towns in question, and the construction of a main sewer whose outlet should be at Barking.

He states that all the towns surrounding London who have tried to deal with their sewage independently have failed, and that some have combined and succeeded. After detailing some of the failures, he draws the moral that "if any practical result is to come from the present inquiry respecting the Lea valley, it must be that the outline of a plan should be determined upon, and then a representative body formed to carry out that plan; but if the representative bodies are left each to advocate their own particular crotchets, my experience is that it must result in failure." He estimates that the cost of his plan would be under £600,000, being an expenditure of about 5½d. in the pound. At the outlet he proposes to have precipitation-tanks at a level above high tide on a system more complete than that proposed for the London sewage, and provides for the use of ten grains of lime and eight grains of sulphate of alumina per gallon of sewage for precipitation purposes, which is more than double the amounts proposed by the Metropolitan Board of Works.

Mr. Bailey Denton presented his scheme, which is also for a general intercepting-sewer, but more cheaply constructed, being in part an open ditch, the estimated cost being £456,500. It is not our purpose, however, to compare or to comment upon the different schemes, but to emphasize the moral drawn by Sir Joseph Bazalgette—viz., that conjoint action is necessary, that a representative board must be created, and that that board must employ skilled engineers to do the work. No two engineers would probably do it in precisely the same way, but the differences between the plans made by men of skill and experience would be in reality much less than they would seem to be in a commission composed of men who know little or nothing of the subject.

The evidence of Mr. Bryan, the engineer to the East London Water-Works Company, is somewhat amusing, his main contention being that his company should not bear any of the expense required to secure a pure intake from the river. He thinks the water is good enough, and that the company don't care much about getting water from the Lea, as he has a scheme for tunnels in the chalk at a depth of 200 feet or

thereabouts from which he can get as much pure water as he wants. This may or may not be so, but as long as the company is drawing its main supply from the river it would seem as if the quality of the water it got would be a matter of considerable interest. This, however, is beside the question, which is how to dispose of the sewage of the towns around London, and especially those which drain into the valley of the Lea, and the first thing to be done, as it seems to us, is to provide for conjoint work and leave the details of the scheme to be prepared by experts.

A DRAIN FOR A BEDROOM.

At Pesth the other night thirty poor persons deprived of shelter were discovered by the police sleeping in a hot and dirty water-drain leading from the Pannonia Mill to the Danube. They were entirely naked, and slept with their bodies in the water and their heads on heaps of stone. — V. Y. Sun.

OUR BRITISH CORRESPONDENCE.

Lead-Poisoning in White-Lead Works—Architects and Plumbing and Drainage—Eels in the City Water-Supply—Suffocation of a Prisoner in a Well.

LONDON, October 23, 1886.

THE question of defective or rather inefficient machinery, as at present in use in paint and other factories where white lead forms an ingredient in the article of manufacture, is brought up by a death recently reported from the East of London. A laborer, whose duty it was to shovel white lead in a powdered state into a machine for mixing with linseed oil, died of lead-poisoning. The process of feeding the machine created considerable dust, and the man, like others of his class, wore no respirator, and was not particular in washing and brushing himself before meals. It would seem not too much to expect from the engineering skill of the country that some system of closed hopper for automatic feed should take the place of the shovel in such cases.

Douglas Galton has said either too much or too little, and that, having said so much, he should have taken the slur off the body by naming the person referred to.

The East End of London is not the only place where eels can be found in the water-supply. A gentleman dating from the city of London itself, which is in the province of the New River Company, has "drawn" a live eel about 12 inches long from his office-supply.

The Jury of Inquest on the death of a prisoner in Pentonville prison censures the engineer to whose incompetency the accident was due. One of the warders had tested the well and made a report on the danger of entering it, but his report, intended for the prison governor, got no farther than the engineer, who said there was no danger, and ordered men into the well to clean it. The result was that one prisoner was suffocated and a warder and another prisoner so affected that they had to be sent to hospital. The case reflects on the method of appointing to the technical posts in London prisons which now exists.

SAFETY-VALVE.



HOUSE AT SHORT HILLS, N. J.—F. B. WHITE, ARCHITECT.

MILWAUKEE badly needs a good building law and an adequate force of honest inspectors to enforce it. Like other communities where this safeguard for the public is lacking, Buddensiek building seems to thrive. A correspondent informs us that an old carpenter by the name of Marsh recently put up a tenement-house in which a man was killed through defective scaffolding. The bad character of the construction of the building resulted in an inspection by the Mayor, Chief of the Fire Department, and the Board of Public Works, who found that the house was "neither plumb, square, nor level," and that it was put together with odds and ends in the way of lumber, and yet this trap was intended for a number of families. It is a shame that an enterprising city like Milwaukee should not have a law that would enable its officials to properly punish offenders of this sort.

ON Monday last one of the boiler inspectors of Brooklyn found an engineer without a license and drunk running, or trying to run, a steam-engine which was hoisting bricks where building operations were going on. He was held for trial on the charge of drunkenness.

A proposal, emanating from the Society of Architects (distinct from the Institute of British Architects), for a federation of architects and the rendering of the profession a "closed" one, by act of Parliament, is creating some attention. The proposal is apparently a sound one, and it is a pity that the members of the profession are divided on the question. The somewhat foolish reference by the principals in the movement to the institute as an institute of architects has not done the proposition any good.

The statement made by Captain Douglas Galton before the Sanitary Institute at York will not be well received by the leading architects here. He stated that, in connection with a Public Day-School Company with which he is connected, an architect of eminence had been employed to build one of the largest schools. Recently, on investigation of the drainage under the building, it was found that, to a great extent, the drains not only fell the wrong way, but were absolutely without any jointing in many cases, and that in one place the pipes did not meet within two inches, and had a joint made of zinc and string. Architects of eminence will probably hold that Captain

RESIGNATION OF HON. R. P. FLOWER.

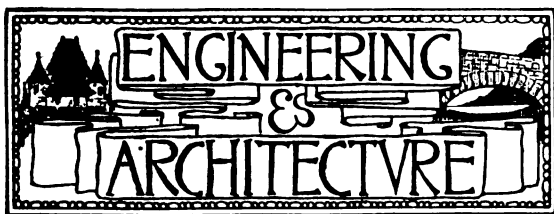
THIS community owes a debt of gratitude to the Hon. Roswell P. Flower, the recent Chairman of the Electric Subway Commission of this city. Mr. Flower lately resigned as a commissioner, his private interests demanding his attention, though not until he had seen the work of the commission well on toward a solution of the problem that, until his appointment, had not been intelligently grappled with. As is usual with those who, with public spirit, serve the public, his reward has been in the shape of malicious reports attributing mercenary and improper motives. Some people are so constituted that they readily believe ill of any one, but his letter to the daily press, in which he denied having any interest, past, present, or prospective, in the corporations doing work for the city, was not needed to convince any one that knew him of the contemptible and false character of these reports. The appointment of Mr. Gibbons, his private secretary, and late counsel to the commission, without his suggestion, as his successor, is a good one, and his selection creditable to Governor Hill.



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FIRE-PROOF CONSTRUCTION.

BY F. COLLINGWOOD, M. A. S. C. E., AND M. INST. C. E.

No. VIII.

(Continued from page 372.)

CONTINUING the subject of floors and partitions, it will be useful to refer to a paper read before the American Society of Mechanical Engineers by Mr. W. E. Ward (see Vol. IV. of Transactions), on "Beton in combination with iron as a building material." The author having noted the great adhesion there was between beton and iron, conceived of the use of iron to strengthen beton construction. He made an experimental beam of beton 12 feet long, 12 inches deep, and 5 inches wide, burying in it a 4-inch iron I-beam weighing thirty pounds to the yard, the iron beam reaching within one inch of the bottom of the concrete. The I-beam alone would support safely a load of 1,150 pounds. After thirty days' setting, the compound beam was loaded with 9,500 pounds central load, with a deflection of seven-sixteenths of an inch, returning to the original line when the load was removed, and showing no sign of injury, and demonstrating that the two materials worked together. In an experimental house built entirely of beton, he introduced beams of this character having 19 feet span. He found fine screenings from broken bluestone to give stronger beton than sand and gravel, and used two parts of such to one of Portland cement. After the beams were built, boards were placed between them and flush with their upper surface to make a mold, and on the whole about an inch of beton was carefully tamped, then rods of iron five-sixteenths of an inch in diameter were placed both longitudinally and laterally over the whole surface, and over all a final layer of two inches of tamped beton. After eight hours this was floated with half an inch of fine cement mortar, mixed in the proportions of one to one cement and beach sand, making a final thickness of $3\frac{1}{2}$ inches. The construction is shown in Fig. 6. In a room where the beams had a span of 18 feet on 6-foot centres, casks of plaster were piled up so as to give a triangular load of thirty tons without injury or sensible deflection. The beam which bore the load was 7x16 inches, with a re-enforcing 7-inch iron I-beam weighing fifty-five pounds per yard buried in its lower portion. The iron beam is placed near the bottom to obtain full advantage of its tensile strength.

Partitions eight feet high were made of beton $2\frac{1}{2}$ inches thick, re-enforced by $\frac{1}{4}$ -inch iron rods (distance apart not stated), and found to be as strong as brick walls eight inches thick laid in cement. He proposes such walls built double at six to ten inches apart with re-enforcing cross-walls every two or three feet as a method of construction. By building floors in this way the spaces can be utilized for heating and ventilation. He had tested bricks of this material to a white heat without their breaking up. He had also heated them to a white heat and plunged them

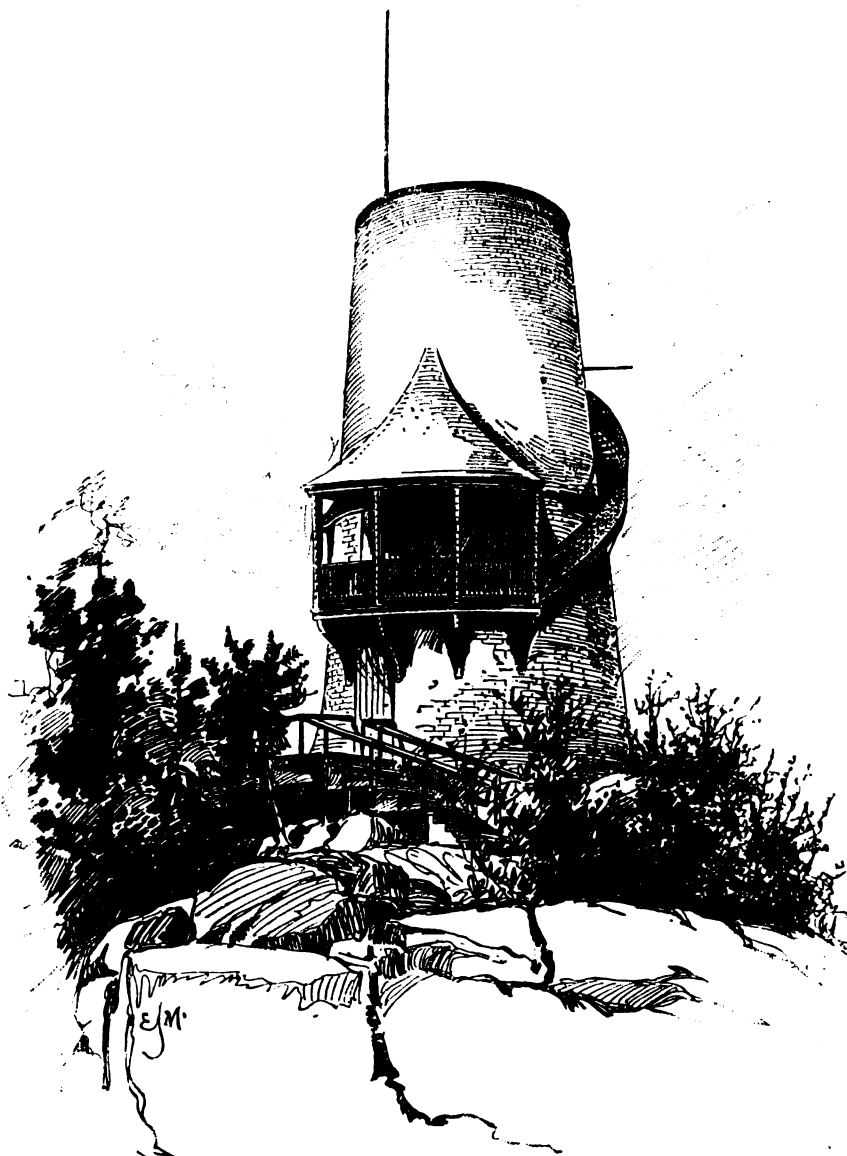
into cold water without showing a decidedly damaging fracture. His final conclusions are:

First—That a system of iron beams re-enforced with beton can be made to sustain weights many times greater than the iron beams alone can withstand without re-enforcing.

Second—That floors and roofs can be economically made of beton re-enforced with iron rods, capable of sustaining heavier loads with a less number of supporting beams, than any other system of flooring and roofing now in use, at equal cost.

His third and fourth conclusions are in respect to its advantages for introduction of steam or hot-water systems, and for ventilation.

Fifth—That it affords a perfect defence against the interior destruction of buildings by fire.



A WATER-TOWER AT SWAMPSCOTT, MASS.—ARTHUR LITTLE, ARCHITECT, BOSTON.

The author claims, also, that the use of iron in this way tends to check the tendency of beton to crack, in hardening, citing a floor 18x36 feet without a trace of a crack after six years' time.

In the discussion which followed the reading of this paper, Mr. Woodbury stated that he had never known a floor made of plank covered with an inch of mortar to be burned through, although at Allendale, R. I., the whole roof of such a building burned off and endangered the surrounding property, but without the fire going down through the floor. It is, as far as we have had any experience, a practical impossibility for a fire to burn down through a film of mortar three-quarters of an inch in the interior of a floor. It would take a great while for such a floor to be destroyed by a fire beneath it, although it would be quite possible. It would undoubtedly not happen until the columns or beams were destroyed by fire.

COLUMNS.

Reference has been made to the experiments of Professor Bauschinger. He found the deflection of iron columns to be sensibly increased if, when highly heated, water was

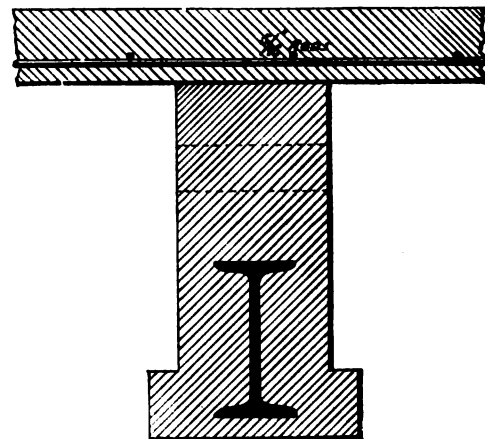


FIG. 6

thrown against one side of them; this was particularly noticeable at points where the core was eccentric, but at points where changes in form occurred rupture took place no more frequently than at other points. The sudden failure of cast-iron columns has been remarked upon practically by all experienced firemen. Columns whose ends were firmly fixed stood very much better than those which were more free. This shows the importance of well-squared and well-fitted ends, instead of the loose fitting and wedging too often adopted. Wrought-iron columns did not resist bending as well as cast-iron, and the effect of water on a heated wrought-iron column seemed to be greater than on one of cast-iron. From this he infers the great necessity of protecting wrought-iron beams when such are used.

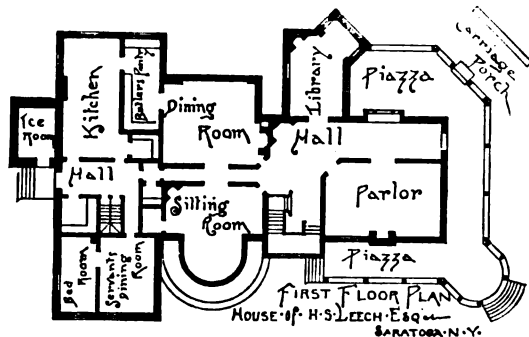
Stone columns of various kinds were tested, both natural and artificial, including granite, tufa, marbles, sandstones, beton, and brick in cement mortar. With stone columns the bending was away from the fire, instead of toward it—probably, he thinks, on account of drying out by the heat. Of natural stones granite stood the fire best, next tufa, and lastly limestone and sandstone. Beton withstood 1,100° Fah. without injury, even when water was thrown on it, but gave out considerable moisture—only becoming dry after long exposure. Brick-work also stood well. The same methods used in protecting iron beams have also been adapted to the protection of

iron columns, and shaped blocks can now be had in porous terra-cotta, etc., by which the columns are built in and made fit to withstand a concentrated heat for a considerable time. The necessary increase in size of the column is objectionable, and there is danger that, in consequence of this, the covering will in many cases be made too light. As the experiment mentioned in the last article showed, 1-inch thickness will withstand the direct impingement of a flame for twelve minutes only, and a greater thickness than this is imperative in any building claiming to be fire-resisting for a reasonable time. Mr. Woodbury, in a discussion on the subject before the Mechanical Society of Engineers, says that a solid wood column, unprotected, "will stand exposure six or eight hours to intense fire before yielding, and it is undoubtedly true that wood columns are to be preferred to iron to resist fire, unless the latter are thoroughly protected.

OUR SPECIAL ILLUSTRATION.

A PRIVATE RESIDENCE AT SARATOGA SPRINGS.—S. GIFFORD SLOCUM, ARCHITECT.

Our illustration shows the residence of Harry S. Leech, Esq., at Saratoga Springs, N. Y. The first story is built of Jersey brownstone, the second of cement and wood.



and shingle work. The foundation is of bluestone. The interior finish of the first floor is of old English quartered oak, except in the library, where it is of cherry. The architect was S. Gifford Slocum, of Saratoga Springs.

OUR ILLUSTRATION OF A MODERATE-COST HOUSE.

A RESIDENCE AT SHORT HILLS, N. J.—F. B. WHITE, ARCHITECT.

The subject of our vignette illustration this week is a residence built by Mr. Stewart Hartshorn at Short Hills, N. J. First story is of stone, shingled frame above. The interior is hard wood for first-story rooms, main hall paneled walls and ceiling, other rooms white wood stained. Cost, \$10,000. The architect was the late F. B. White, of New York.

THE NEW CROTON AQUEDUCT.

No. XI.

(Continued from page 274.)

THE GATE-HOUSE AND CONNECTIONS.

In our issue of November 5, 1885, last we published a number of cuts of the gate-house, together with a brief description. We now republish the same (Fig. 1), with the chambers numbered for more direct reference, and a fuller notice; and also a view (Fig. 2) of the new inlets for the entrance of the water to the gate-house.

pass will enter at 250 feet up stream from the present inlet, and at elevation 140 feet, thus giving fifteen feet more draught. The finished shaft at the entrance to the by-pass will be 8'x14', and a slide-valve, to be lowered by windlass, will be prepared for insertion, should access to the by-pass be required for any reason.

Referring to Fig. 1 it will be seen that the by-pass marked G will enter the gate-house into the chamber numbered 1, and this will be the only inlet of any use, unless the new dam be built. To provide for using water from the new reservoir, four more inlets are provided, three of which are shown in Fig. 2. One of these marked H, called the surface-inlet, has its invert at elevation 184½ feet, or 15½ feet below flow-line of the new reservoir. This inlet also enters chamber 1, and vertically over the by-pass.

The other two are called the *middle* and *bottom* inlets. The first, marked J, at elevation 166 feet will serve to draw off all water to the level of the old dam, and the other, marked K, at elevation 140 feet will furnish a supply from the new lake below the old dam. By this means the present Croton Lake can be drawn nearly empty for examination if desired; and should the Muscoot Dam be built, a by-pass can be built around Croton Lake for increasing said supply. In like manner Muscoot Dam can be drawn down entirely by emptying the new lake to elevation 166 feet.

The inlets J and K will also have a slide-valve or shield working in front of them in chamber 6. This will serve to divert the flow through either the upper or lower inlet as may be desired. A similar arrangement will be placed in No. 1.

In order to provide against every contingency, the fourth inlet is placed at the north side and enters chamber No. 8. This will be connected with the old aqueduct below the dam, and will be used either for transmitting water to the city from the gate-house by way of the old aqueduct, or (by making a second connection between the new reservoir and the old aqueduct) for transmitting water to the new aqueduct through the gate-house. To make this last connection thoroughly effective, there will be a gate-house at the new dam, with openings at four different levels—viz.: 184½ feet, 166 feet, 140 feet, and 85 feet—by means of which a complete circulation can be obtained in the deep part of the new lake, and all stagnation be prevented.

The portion of the old aqueduct thus used between the new dam and the main gate-house will have a pressure both outside and inside, and can therefore be safely used in this way.

gates at elevation 139½ feet. To relieve the great pressure on these gates and make it easier to move them, a small pipe with valve will pass through the wall between the chambers, so that No. 2 can be partly filled before the gates are opened. Similar gates are provided between chambers 2 and 3, and 3 and 4; there are also two gates provided in each of the latter cases at elevation 165½ feet for use in case the great dam be built. From chamber 4 the water will pass to 5 through four gates at 139½ feet; from 5 it will pass into the screen-chamber, and thence into the aqueduct through the screens. In case the inlets at J and K be used, the water will enter chamber 6 and pass to 7 through four gates at elevation 130½ feet, and thence to 3 by either four lower or two upper gates, as in passing from 2 to 3. In case of accident to any of these gates, water can be passed from 2 to 10 by two gates at 139½ feet, and 10 to 5 by two others at same elevation.

Water can be passed from 8 to 9 from the connection with present aqueduct through two gates at 154½ feet elevation, and 9 to 3 by two similar gates, or the direction may be reversed.

Chamber 12 is for a turbine to run a centrifugal pump connected with the sump (No. 11) in same chamber. The sump (with bottom at 130 feet) is connected with chamber No. 13, and drain-pipes connect each of the chambers 2, 3, 4, 5, 7, and 9 with 13, so that by closing the gates in any one chamber and opening the drain, the chamber can be cleared of water when required without interfering with the supply to the city. The gates in 13 are all twelve inches. They will also serve another important purpose—viz., by opening any two valves so as to make a communication between two chambers, water can be passed from a full to an empty one, for the purpose of relieving the pressure on the gates of the latter.

The turbine may also be connected to the machinery for moving the gates. Stop-planks will be placed in No. 4, making a temporary weir by which to deaden the flow between 3 and 4. Iron protections will also be placed in front of the upper gates, and at other points where required to prevent injurious wash of the masonry by the inflowing water. The object of this somewhat complicated system is to so arrange the several parts that when the great lake is built the water may be locked down from a head of forty-six feet above the top of the aqueduct and enter smoothly; and also, so that every part of the work may be examined and repaired without interfering with a constant supply to the city. Reference to the several sections of the gate-house and general plan of the work, published in

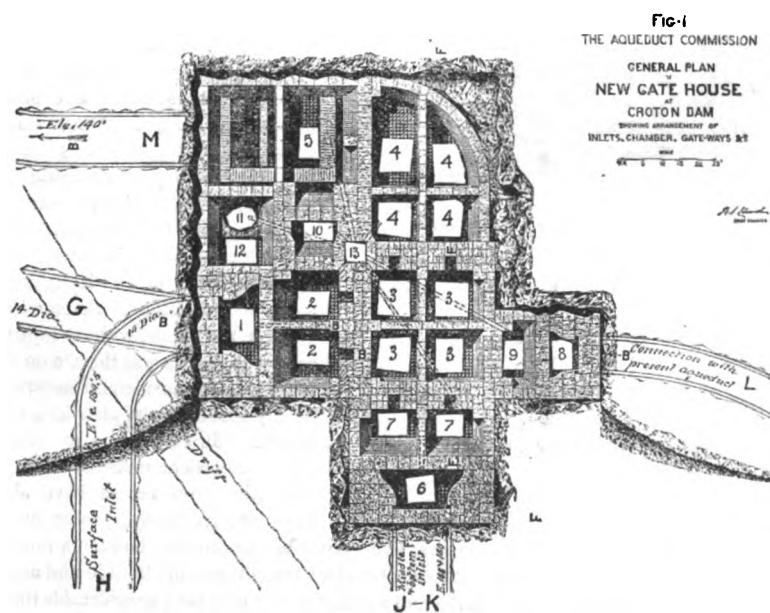


FIG. 1
THE AQUEDUCT COMMISSION
GENERAL PLAN
NEW GATE HOUSE
AT
CROTON DAM
SHOWING ARRANGEMENT OF
INLETS, CHAMBERS, GATEWAYS, &c.

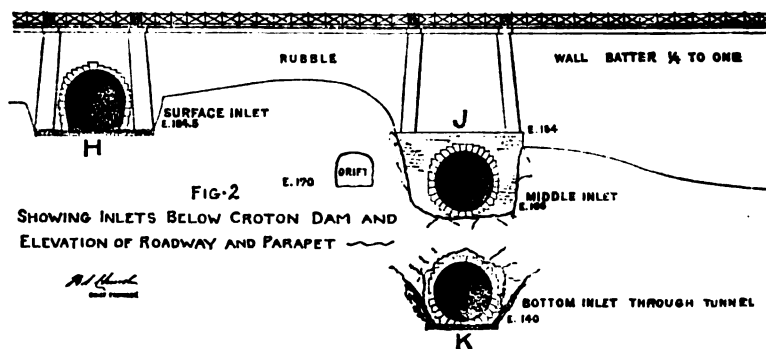


FIG. 2
SHOWING INLETS BELOW CROTON DAM AND
ELEVATION OF ROADWAY AND PARAPET

As has been heretofore stated, the present inlet will take the water from a point 100 feet above the Croton dam at an elevation of 155 feet above datum. The crown of the old dam is at elevation 166 feet, and the flow-line in the new reservoir is to be at elevation 200 feet, thus raising the water thirty-four feet over the old dam and extending the lake 4½ miles further down stream. In locating the new gate-house it was thought desirable to place it near to the present one, but entirely to one side of the present aqueduct as a matter of safety against accident; and hence the deep excavation in the hillside became necessary. The first provision to be made was for passing the present supply into the new aqueduct, and in order to be able to draw the present Croton Lake lower in case of necessity, the "by-

For the purpose of cleansing the lower part of the new reservoir, there is to be a blow-off provided through the dam at elevation about eighty-five feet. It will thus be seen that the utmost care has been taken to provide means for preserving the purity of the supply, and supplying ample facilities for cleansing the reservoirs in every part should it be necessary.

The new aqueduct will leave the gate-house from chamber No. 5 at M, Fig. 1, at elevation 140 feet, with a grade of 1/10 of a foot per mile. A new highway is to be built in front of the house with a retaining wall twenty-four feet high next the river, finished with a stone coping and a handsome iron railing, as shown in Fig. 2.

From chamber No. 1 the water passes to No. 2 by four

November, 1885, will make all other points clear.

It should be added that the turbine will take its supply from the surface-inlet H at 184½ feet elevation, and discharge into the aqueduct, thus giving over forty feet head for power.

(TO BE CONTINUED.)

MR. JOHN W. WESTON, editor of the *American Engineer*, of Chicago, has been appointed Commissioner-General for the United States of the International Exposition of Railway Appliances and Industries to be held in Paris in 1887. The prospectus of this exhibition was noticed in our supplement of November 6.

A WATER-METER FOR IRRIGATION.*

ENGINEERS of irrigating works have long felt the want of a cheap, practical, and reasonably accurate method of measuring small volumes of flowing water, as selling or dividing it by the acre or area irrigated offers very great inducements for waste and has many other serious disadvantages.

Selling it by the methods of measurement now in use causes more vexation and dissatisfaction, to say nothing of legal entanglements and expenses, than all the other work of an irrigating enterprise.

The company by which the author is employed proposed to furnish and distribute the water required for irrigating about 600,000 acres of land, and the legal advisers of the company strenuously opposed selling it by the acre irrigated. They urged that some method of direct measurement be adopted, stating as a matter of experience that every settler upon the land would otherwise become seriously dissatisfied, and to have such a great community with a common cause of complaint against the company would be a constant menace to it.

The miners' inch is the usual unit of water measurement in this locality, and by custom and partly by statute the "4-inch" miners' inch is the particular kind used.

It purports to be the quantity of water which will flow through an inch square orifice in an inch board with a head of four inches above the centre of the orifice. It is in reality the quantity of water which will flow through an inch square orifice in an inch board, with a head above it depending upon the care used in adjusting the admission-gate, and on the fluctuations in the volume of water flowing in the channel conducting the water to this gate.

It has been described as a "nondescript inch which can scarcely be accredited with a remote approximation to correct measurement."

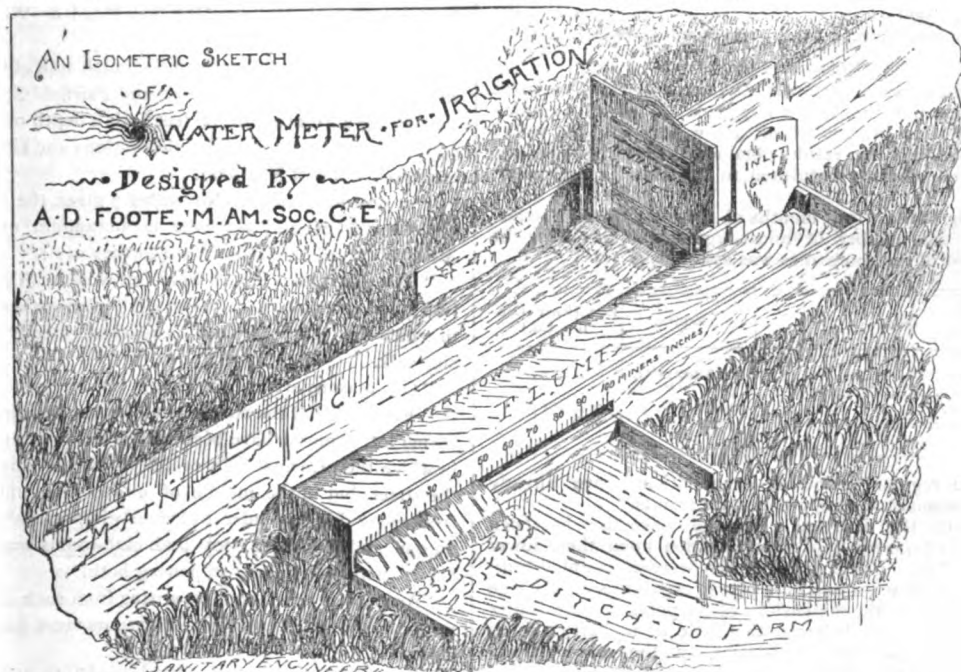
I am well aware that the measurement is not *absolutely* accurate or uniform, but if it is remembered that the variation in delivery is only as the *square root* of the variation in head, and that owing to the long excess or overflow weir the variation in head is only a small fraction of the variation in the delivering ditch, it will be seen that the actual delivery through the orifice is *very nearly* uniform.

There need be but an inch or two loss of grade in the ditch, as but very little more water should be stopped than is delivered through the orifice.

The adjusting gate, or rather obstruction, in the main ditch should back the water sufficiently to keep the excess weir clear, and at the same time keep (say) a quarter of an inch of water on its crest, and the surface of the water in the box should then be exactly four inches above the centre of the delivering orifice.

The principle of the long excess weir can be used, of course, for delivering water through an open notch or weir, but it is more accurate with a pressure or head, and the greater the head the greater the accuracy, as will readily be seen.

Any one using the water will naturally adapt it to their own circumstances and desires. It is cheaply constructed and easily placed in position, costing from four to six dollars; quickly adjusted, as the gates do not have to be precisely set; needs no oversight or supervision (if properly locked, as they should be) until a change in volume is desired; will deliver a large or small quantity, which is a great convenience, as the irrigator usually wants a small stream continuously and a large stream on irrigating days is not likely to clog as floating leaves and grass pass over the excess weir. Half-sunken leaves may catch in the orifice, but as it is to the farmer's interest to keep that clear he will probably attend to it.



It is called unscientific, inaccurate, unsatisfactory to both seller and buyer of water, and yet it is the best and almost only method used in the whole western part of our country for measuring flowing water in small quantities. In some parts of Colorado a so-called "head" is used, but it is no more accurate than the inch and not as convenient.

After much consideration it seemed to the author that the miners' inch, although so much derided by engineers, had many valuable qualities. One theoretical inch as above described delivers 1,800 cubic feet of water in twenty-four hours. Forty-eight of them equal one cubic foot per second, therefore easily translated in scientific or standard terms. It is small enough not to require subdivision, which is a great convenience.

Some time since the meter shown in the adjoining isometrical drawing was constructed for measuring "4-inch" miners' inches. For months it has done its work in a very satisfactory manner, seldom clogging and never varying in its delivery to an appreciable amount.

The apparatus is so simple that the sketch will explain it better than words. The whole value of the meter depends upon the long weir, perhaps better described as an excess or returning weir, which returns all excess of water in the box back to the main ditch, and thus keeps the pressure at the delivery orifice practically uniform.

To me, however, the 'greatest merit which the method possesses, excepting its accuracy, is that the irrigator himself, with his pocket-rule, can at any time demonstrate to his entire satisfaction that he is getting the full amount of water he is paying for.

The author has no patent on the invention, is well satisfied with its use, and desires the opinions of others upon it.

WATER-PURIFICATION: ITS BIOLOGICAL AND CHEMICAL BASIS.*

THE earliest attempts to purify water had for their object simply the clarification of the liquid—i. e., the removal of suspended particles visible to the naked eye. In this purification there was no endeavor to remove dissolved matters, and suspended particles invisible to the naked eye were not then thought of. It cannot be doubted that, in most cases, this primitive conception of water-purification has still been retained, the sole idea of the operator being to produce a liquid clear and sparkling to the eye.

The advances of chemical science caused attention to be paid to the matters present in water in the state of solution, and more particularly to those of an organic nature. In the first place, it was supposed that organic substances were capable of imparting alteration and decay to other organic substances with which they were placed in contact; this being the theory of fermentation advanced by Liebig.

The theory, or rather dogma, of fermentation enunciated by Liebig was soon broken down by the classical researches

of Pasteur, by whom it was shown that the processes of fermentation and putrefaction were due, not to decomposing organic matter, but to living organisms, and that living organisms were also certainly the cause of some and probably of all zymotic diseases. Under these circumstances, the organic matter present in water came to be viewed in a different light, and instead of being regarded as in itself unwholesome, it could now only be taken as affording more or less evidence of the possible presence of organisms, endowed with virulent properties.

Under these circumstances, it was natural that means should be devised to render water as chemically pure as possible, on the assumption that the conditions which tended to improve the chemical quality would similarly affect it biologically. The is essentially the period of the late Rivers Pollution Commission, in which so many methods of water and sewage purification are fully discussed by the light of chemical analysis. In these discussions, the importance of the biological side of the subject is fully recognized, but owing to the absence of any reliable methods at that time, the examination was not pursued in this direction.

It is thus evident that the purification of water must now be regarded from two distinct points of view—the chemical and the biological—and that whereas formerly the biological side was almost wholly of a speculative character, it is now nearly, if not quite, as tangible as the chemical side. Thus, perhaps a concrete example will most clearly illustrate how the purification of water should be regarded. Supposing that water, derived from a source which is altogether unimpeachable as regards contamination with animal matters, is yet so highly impregnated with vegetable constituents as to be objectionable for drinking purposes, the question will arise how this water may be treated so as to render it suitable for domestic supply. In a case of this kind it is obvious that chemical purification will be of paramount importance, while the removal of organic life from the water will be of less pressing consequence. On the other hand, if water which is known to have received sewage matters is to be supplied for dietetic use, and if this water, as is so often the case, is not objectionable on account of the absolute quantity of organic matter which it contains, but only because of the suspicious origin of a part of this organic matter, then it is evident that in the purification of such water the point to be taken primarily into consideration, is how the organic life it contains can be reduced to a minimum.

PURIFICATION BY FILTRATION.

Until the method of water-examination by gelatine culture was devised, there were no available means by which the relative efficiency, for the removal of micro-organisms, of different filtering materials could be estimated on a quantitative basis.

The Author has submitted to examination, as regards their efficiency in this respect, a number of filtering materials, employing in all cases equal thicknesses of the various substances, which were also prepared in the same state of division. The filtering stratum was constructed exactly six inches in depth, and the filtering material was, with a few exceptions, made to pass through a sieve of 40 meshes to the linear inch. The results obtained in these experiments were:

Filtering material.	Efficiency.	Organisms per cubic centimetre.		Reduction per cent.	Approx. rate of filtration per sq. foot per hour.
		Unfilt'd water.	Filtered water.		
Fermigenous green - sand (from Redhill, Surrey).....	Initial.....	80	....	100.0	..
	After thirteen days' action....	8,000	1,000	88.0	0.73
	After one month's action.....	1,280	780	39.0	1.14
Animal charcoal.....	Initial.....	Too numerous to count	....	100.0	..
	After twelve days' action....	2,800	..	100.0	0.46
	After one month's action.....	1,280	7,000	Increase 447.0	0.86
Iron sponge.....	Initial.....	80	....	100.0	..
	After twelve days' action....	2,800	....	100.0	0.40
	After one month's action.....	1,280	2	99.8	0.45
Brick - dust (pulverized red brick).....	Initial.....	3,000	730	76.0	..
	After five weeks' action.....	6,000	400	93.0	0.48
	Initial.....	3,000	....	100.0	..
Coke.....	After five weeks' action.....	6,000	90	98.5	0.50

Vegetable Charcoal.—The very favorable results obtained with coke led the Author to investigate the filtering power of the still more porous vegetable or wood charcoal. This material was also passed through the same sieve, and employed in filters of similar construction. In the first experiment urine-water was used, with the following results:

INITIAL EFFICIENCY—SECOND DAY.

Unfiltered water..... 9,700 organisms per cu. centimetre.
Water filtered through fine charcoal.....
Reduction = 100 per cent.

Later experiments were made with an aqueous extract of soil, the following extracts being obtained:

INITIAL EFFICIENCY—SECOND DAY.

Unfiltered water..... 2,898 organisms per cu. centimetre.
After filtration through fine wood charcoal.....
Reduction = 100 per cent.

Approximate rate of filtration = 0.22 gallon per square foot per hour.

* Abstract of a paper read by A. D. Foote, M. Am. Soc. C. E., before American Society of Civil Engineers.

* Extracts from a paper by Percy F. Frankland, Ph. D., B. S., F. C. S., F. I. C.

AFTER ONE MONTH'S ACTION—TWENTY-NINTH DAY.

Unfiltered water..... 2,230 organisms per cu. centimetre.
 After filtration through wood { 107 " "
 charcoal..... " "
 Reduction = 95 per cent.
 Approximate rate of filtration = 0.22 gallons per square foot per hour.

It has generally been supposed that most filtering materials offer little or no barrier to micro-organisms, and that the latter are capable of passing without sensible obstruction through the pores of filters containing pulverized materials. These experiments, however, show that it is extremely simple to construct filters which shall possess the power of removing micro-organisms, in the first instance at least. This power is, moreover, possessed by substances which exercise scarcely any chemical action on the organic matter present in the water—e. g., coke, vegetable charcoal, and biscuit-porcelain—as well as by those which reduce both the organic and the mineral ingredients of the water to a very marked extent, like animal charcoal and iron.

It appeared probable, from the results of the filtration experiments already described, that organized substances might be largely removed by mere contact with finely divided matter. A series of experiments was consequently undertaken with a view to ascertain to what extent this was the case, and in some instances the reduction was found to be much greater than could have reasonably been anticipated.

In these experiments water containing micro-organisms was shaken up for a definite length of time with a given quantity of the finely divided matter, which was used in the same state of subdivision as in the filters already described. The water was then allowed to subside, and the clarified water submitted to examination, as soon as possible after complete subsidence had taken place, as it appeared probable that if the organisms were simply carried to the bottom by the subsiding particles without suffering any injury, they would rapidly again become distributed through the upper layers of water by multiplication. This supposition has been amply verified by experiment.

Agitation with Spongy Iron.—The water was shaken with one-tenth of its weight of this material for fifteen minutes. The water was allowed to subside for half an hour before examination.

Untreated water contained..... 609 organisms per cu. centimetre.
 After fifteen minutes' agitation..... 63 "
 Reduction = 90 per cent.

On another occasion the water of the Thames, at Hampton was shaken with spongy iron for fifteen minutes, with the following results:

Thames water..... 155 organisms per cu. centimetre.
 After fifteen minutes' agitation..... 10 "
 Reduction = 93 per cent.

Agitation with Chalk.—Urine-water was shaken for fifteen minutes with one-fiftieth of its weight of chalk, and then allowed to subside for five hours:

Untreated water..... 8,000 organisms per cu. centimetre.
 After agitation..... 270 "
 Reduction = 97 per cent.

Agitation with Animal Charcoal.—Urine-water was shaken with one-fiftieth of its weight of animal charcoal for fifteen minutes, and then allowed to subside for nearly five hours:

Untreated water..... 8,000 organisms per cu. centimetre.
 After agitation..... 60 "
 Reduction = 99 per cent.

Agitation with Vegetable Charcoal.—Water containing soil extract was shaken with one-fiftieth of its weight of ordinary wood charcoal for fifteen minutes, and was then allowed to subside for twenty-seven hours:

Untreated water..... 3,000 organisms per cu. centimetre.
 After agitation..... 120 "
 Reduction = 96 per cent.

Agitation with Coke.—Urine-water was shaken with one-fiftieth of its weight of fine coke for fifteen minutes, and then allowed to subside for forty-eight hours:

Untreated water..... Too numerous to be counted.
 After agitation with coke..... None.
 Reduction = 100 per cent.

Further experiments made with water containing soil extract have shown that this process of purification is unreliable, owing apparently to the numerous conditions which are necessary for its success. In some cases the number of organisms in the clear liquid was greatly increased, this being doubtless due to a reascension and multiplication of those which were at first carried down. Thus in one series of experiments the following results were obtained:

Untreated water..... 3,000 organisms per cu. centimetre.
 After agitation with coke and { 20,000 " "
 twenty-six hours' subsidence..... " "

PURIFICATION OF WATER BY PRECIPITATION.

As by far the most common and most important method of water-purification dependent upon precipitation is the well-known Dr. Clark's process, the effect of this on organized matters was made the subject of special study. With this view the Author has examined the process both in the laboratory as well as on the large scale as practiced by manufacturers and by water companies.

Laboratory Experiments.—For testing the efficiency of the process on the laboratory scale, three stoppered Winchester quart bottles were taken, and to each were added two litres of ordinary London (Thames) water, to which a convenient proportion of organisms had been imparted by the addition of urine-water. To two of these bottles, 100 cubic centimetres of clear lime-water were added, this

being calculated to remove 11.6 parts of carbonate of lime per 100,000 parts of the water. Each of these bottles was violently shaken, and the contents were then allowed to subside for eighteen hours. The bottle to which no lime-water had been added was tested without disturbing the precipitate, as was also the third bottle which had been left at rest in the same place as the other two. These tests showed the following numbers of organisms to be present in the water before and after treatment:

Untreated water..... 85 organisms per cu. centimetre.
 After eighteen hours' rest..... 1,922 "
 Water after treatment by Clark's { 42 " "
 Process and eighteen hours' { " "
 subsidence..... " "
 Reduction on original = 51 per cent.

At the Colne Valley Water-Works, the hard water (see analyses given below) obtained from a deep well sunk into the chalk is mixed with the requisite proportion of clear lime-water and then allowed to settle in open tanks. The subsidence is so rapid that under favorable circumstances the upper layers of water are, after three hours' time, fit for distribution. On the occasion of the Author's visit, however, boring operations were being carried on, and the water was in consequence milky, and the necessary subsidence after softening had to be increased to two days.

A perfectly representative sample of the water before softening could unfortunately not be obtained, and the number of organisms found in the untreated water is probably in excess of that which was present in the unsoftened water. The following results were obtained:

Unsoftened water..... 322 organisms per cu. centimetre.
 Water after softening and two { 4 " "
 days' subsidence (from main)..... " "
 Reduction = 99 per cent.

In Gaillet and Huet's process, as carried out at Mr. Duncan's, the water from an artesian well, sunk into the chalk below the London clay, is mixed with a suitable proportion of lime-water and caustic soda, the mixture being then made to pass upwards through a tower provided with oblique diaphragms, which accelerate the precipitation of the carbonate of lime. The passage through this tower occupies a period of about two hours. Samples of the water before and after treatment were examined with the following results:

Well water from tanks..... 182 organisms per cu. centimetre.
 Softened water..... 4 "
 Reduction = 98 per cent.

Gelatin Process Applied to London Waters.—For more than a year past the Author has made periodical examinations by this process of all the waters supplied to the metropolis, and the results obtained since September last have been officially furnished to the Local Government Board.

During the last four months of 1885, the average reduction in the number of micro-organisms effected by the treatment of the companies was as follows:

1885.	Thames.	Lee (East London Co.)
September.....	97.8 per cent.	.....
October.....	96.5 " "	.....
November.....	98.9 " "	98.5 per cent.
December.....	98.5 " "	88.8 " "

These regular periodical examinations have already yielded some exceedingly important results.

Thus for the first time a definite conception has been obtained of the effect of sand-filtration upon these lower forms of life. Hitherto those who were acquainted with the size of these minute microscopic organisms on the one hand, and with the dimensions of the pores in a sand-filter on the other, have believed that little or no barrier could be offered to these organisms by the comparatively spacious pores of the filter, and even the strongest advocate of sand-filtration could not have reasonably anticipated that mere filtration through a few feet of this material could effect the remarkable reduction in the number of micro-organisms to which the above table bears witness.

The factors which, in the Author's opinion, are more especially calculated to influence the number of micro-organisms present in the distributed water are the following:

1. Storage capacity for unfiltered water.
2. Thickness of fine sand through which filtration is carried on.
3. Rate of filtration.
4. Renewal of filter-beds.

1. Influence of Storage Capacity for Unfiltered Water.—The influence which this factor may exercise upon the organized matter in water is manifold. In the first place, through greater storage capacity, the necessity of drawing the worst water from the river is avoided, a matter which in the case of a river like the Thames, which is liable to frequent floods, is of great importance. During the period of storage, subsidence takes place, the water becoming poorer in suspended particles of all kinds. Again, in these storage-reservoirs a process of starvation may go on, for the organisms present in the impounded water find themselves imprisoned with a limited amount of sustenance, which they rapidly exhaust, and then perish in large numbers, falling to the bottom. This phenomenon is sufficiently familiar to all who have made the cultivation of micro-organisms a subject of study.

2. Influence of Thickness of Fine Sand.—That the thickness of the filtering stratum should exercise an important influence on the number of micro-organisms passing through the filter will be sufficiently obvious to every one. In referring to his laboratory experiments on filtra-

tion, the Author has already pointed out that comparatively thin strata of various materials are capable of largely, and sometimes of wholly, removing the micro-organisms in the water passing through them, but that this power is gradually lost; it is only reasonable to suppose that a thicker stratum will lose this power less rapidly than a thinner one. In estimating the thickness of the filtering stratum, the fine sand only should be taken into consideration, as it is only this portion of the filter which can have any effect in the removal of micro-organisms.

3. Influence of Rate of Filtration.—That the removal of micro-organisms is less perfect when the rate of filtration is increased, and *vice versa*, has been illustrated by the results obtained in the experiments already referred to.

4. Influence of Renewal of Filter-beds.—As already pointed out, even the most perfect filtering media sooner or later lose their power of retaining micro-organisms, and hence the importance of frequent renewal is sufficiently apparent.

THE COMPETITION FOR PLANS OF THE ALGONQUIN CLUB-HOUSE, BOSTON, MASS.

MESSRS. MCKIM, MEAD & WHITE, architects, of this city, prove to be the successful competitors for plans of the new club-house which the recently organized Algonquin Club will build on Commonwealth Avenue, in Boston. This club, designed to be for Boston what the Union Club is for New York, was incorporated last spring, among the incorporators being Oliver Ames, Edward A. Taft, and Thomas E. Proctor. The President is John F. Andrews. The Building Committee invited the following firms to submit plans in competition: McKim, Mead & White, of New York, Peabody & Stearns, Cabot & Chandler, Shaw & Hummel, John Sturgis, and Carl Fehmer, of Boston. The designs sent in, in response to this invitation, were in the hands of the committee some five weeks, and were rigidly criticised. Finally, one set were selected, and the *nom de plume* proving to be that of Messrs. McKim, Mead & White, they have been selected.

The club-house will stand on the north side of Commonwealth Avenue, between Exeter and Fairfield Streets, the site having a frontage of 82 feet and a depth of 124 feet, and the building, exclusive of decorations and kitchen, it is estimated will cost \$160,000.

The Boston *Herald* of November 7 gives the elevations and floor-plans, and also the memorandum of Messrs. McKim, Mead & White, in which they say:

"The particular point to which we would call your attention is the selection of a 'basement' plan rather than one in which the principal floor is reached directly from the sidewalk.

"Our reasons are as follows:

"Firstly—Had the site selected for the building been a corner lot, it might have been desirable to arrange a plan in which the principal floor could be reached directly from the street, but in the middle of a block the limitations of frontage and light render it obviously impossible to provide on one and the same floor both club-rooms and dependencies, without seriously impairing both.

"Apart from the discomfort arising from such an arrangement, the actual sizes of the club-rooms must inevitably be curtailed.

"Secondly—By any but a 'basement' plan, the entrance to the club-house, whether in the centre or at one side, must either destroy the connection of any suite of rooms or lessen their frontage on Commonwealth Avenue.

"Thirdly—We need scarcely urge upon the attention of your committee the very great importance to the dignity of the building of a central entrance.

"Finally—The style of the exterior has been based on that prevalent in the seventeenth century in France during the reign of Louis XIII., a brick and stone architecture thoroughly modern in character.

"Effort has been made to give it the expression appropriate to a club-house—that is to say, neither palatial nor domestic, though partaking of both.

"The material proposed is brick, with a light-colored stone, preferably a limestone, because of its superiority to all sandstones in beauty and durability.

"In our elevation the roof has been omitted, as it is not designed to be a feature visible from the street."

AMERICAN SOCIETY OF MECHANICAL ENGINEERS.

THE seventh annual meeting of the American Society of Mechanical Engineers will be held in this city, beginning November 29, and ending December 3. The sessions will be held at the hall of the New York Academy of Medicine at No. 12 West Thirty-first Street.

The Sanitary Engineer and Construction Record

DEVOTED TO

Engineering, Architecture, Construction, and Sanitation.

A JOURNAL FOR THE ARCHITECT, ENGINEER, MECHANIC, AND MUNICIPAL OFFICER.

VOLUME 14.]

NEW YORK, NOVEMBER 13, 1886.

[NUMBER 24.]

[TOO LATE FOR CLASSIFICATION.]

PROPOSALS.

(Continued on page 573.)

HEADQUARTERS SOUTHERN BRANCH,
NATIONAL HOME FOR D. V. SOLDIERS,
HAMPTON, VA., November 4, 1886.

Sealed proposals will be received at this office until twelve o'clock, noon, Thursday, the eighteenth (18th) day of November, 1886, for furnishing appliances, supplies, labor and materials, etc., for various apparatus and constructions for Steam-Heating, and Steam, Gas, and Water-Supply and Sewerage for the Southern Branch of the National Home for D. V. Soldiers, near Hampton, Va.

Specifications and drawings can be seen at this office, and further information obtained from Capt. P. T. Woodfin, Governor of the Home.

WILLIAM C. GUNNELL,
Civil-Engineer.

24

UNITED STATES ENGINEER OFFICE, 34
West Congress St., Detroit, Mich., November 13, 1886. Separate sealed proposals relating to improving Saint Mary's River and Saint Mary's Falls Canal will be received in triplicate at this office until 2 p. m., December 13, 1886, and then publicly opened:

1. For furnishing one dredge, one tug, and two dump scows.
2. For furnishing lumber.
3. For furnishing iron drift bolts and spikes.
4. For framing, placing, filling, and completing crib piers.
5. For furnishing and placing puddling clay.

For further information apply at this office or at the United States Engineer Office, Sault Ste. Marie, Michigan. O. M. POE, Lieut.-Col. of Engineers, Bvt. Brig.-Gen. U. S. A.

24-25-2

UNITED STATES ENGINEER OFFICE,
P. O. Box 5346, Room 124, P. O. Building,
BOSTON, MASS., November 2, 1886.

Sealed proposals, in triplicate, will be received at this office until 12 o'clock, noon, of December 8, 1886, for dredging and removing from Fort Point Channel, Boston Harbor, Mass., about 60,000 cubic yards of material. For specifications, blank forms, and all information apply to the undersigned.

G. L. GILLESPIE,
Lieut.-Col. of Engineers, U. S. A.



For works for which proposals are requested, see also the "Proposal Column," pages 562 and 573.

CONSTRUCTION.

WATER AND SEWERAGE.

OBERLIN, O.—The Water-works Trustees will receive proposals for constructing a pumping station, two reservoirs, and furnishing and laying about five miles of vitrified pipe. Address the trustees until November 15. Dunham & Paine, of Cleveland, O., are the engineers.

EASTPORT, ME.—A representative of the Woonsocket, R. I., Water-Works was before town meeting November 9, and made a proposition for water-works here, which is to be considered at another town meeting next Tuesday, November 16.

VICKSBURG, MISS.—Representatives of Samuel R. Bullock & Co., of New York City, were before City Council Nov. 11, seeking to make a proposition for the construction of water-works. We have several times referred to this proposition, and the discussion for a new water-supply in Vicksburg.

ALBANY WANTS HYDRANTS.—On November 6, Chief-Engineer Higgins reported to the Mayor that the city will need 196 new hydrants, and it is understood that the Mayor will recommend the purchase of at least a part of them the coming year.

PENNINGTON, N. J.—The Pennington Spring-Water Company has organized and will provide a water-supply. D. A. Clarkson has been elected President, William B. Muirhead Treasurer, and John G. Muirhead Secretary.

HAMILTON, ONT.—The Water-Works Committee find the bids for constructing the new engine house and boiler house at the beach so much in excess of the estimates, that the matter has been held over for revision of the specifications.

WESTVILLE, CONN., wants to make terms with New Haven for a water-supply for fire protection.

MANITOWOC, WIS., will have water-works, as the citizens have decided to submit the matter to a popular election, and there is a strong sentiment in its favor. John Schuelte, ex-Mayor, is interested.

GRAND RAPIDS, MICH., wants a better water-supply for fire protection.

WATER-WORKS AND DAMS.—The Fall Mountain Paper Company, of Bellows Falls, Vt., is having a new dam built on Saxton's River, which they hope may increase the power on that stream. The dam is of the cob-house style, and is to be 30 feet in height and 150 wide. It is being constructed of heavy bunters, and filled in with heavy rock. It will cost about \$3,000.

West Randolph, Vt., proposes to expend \$20,000 for its new water-supply.

The Newton Bros., of Holyoke, Mass., have arranged with manufacturers at Whitingham to raise the dam at the outlet of Sadawga Lake six feet, making a reservoir covering 700 acres, and varying in depth from six to fifteen feet.

EAU CLAIRE, WIS.—The project of building a flume to utilize the waste-water power at the Dell's Dam continues to be agitated by a number of leading citizens.

MOBILE WATER-SUPPLY.—There is said to be a prospect of a lively quarrel over the matter of supplying water to the city. Mr. Louis Stein and the Bienville Company both made propositions to the City Council. The Bienville Company's was the lowest, but as council took no action it was withdrawn, and the company has gone to work laying mains under its charter from the State of Alabama. Stein is still before council, and will fight the right of the other company to proceed with its work.

SYRACUSE, N. Y.—The manufacturers and business men are trying to boom the obtaining of a water-supply from Salmon River, by constructing a natural reservoir on the stream and piping 37 miles to the city. A strong sentiment is being developed in favor.

LANCASTER, PA.—A proposition to purchase 4,000 feet of 6-inch water-pipe is before City Council.

RALEIGH, N. C.—Before acting on the bids for constructing and maintaining water-works, as recently noticed, the Aldermen referred to the Academy of Medicine the question of the wholesomeness of Walnut Creek water, at the place whence the supply was to be derived. The academy have just reported advising that the supply be taken from further up the creek, and that the number of hydrants be 120 instead of 80, as in the proposed contract, and with these changes the contract be ratified. No action has been taken.

HOLMESBURG, PA., WATER COMPANY.—The Holmesburg Water Company was organized, November 4, to provide a supply of water, which will probably be taken from Sandy Creek. The works will include a dam, pumping-station and machinery, subsidizing-reservoir, and stand-pipe. Work will be begun immediately. The directors of the company are W. A. M. Fuller, Amos C. Shallcross, George S. Mills, William Neal, J. Rowland, J. S. Brown, Charles J. Snyder, Furman D. Holme, Justin Boileau, Robert Johnson, C. W. Stout, and William B. Bunker.

WATERBURY.—On the night of November 8 the large water-main which supplies the city

from the reservoir broke, involving the shutting off of water from the entire city for repairs. The consequences were serious. The water famine compelled many manufacturing firms to shut down, and there were scarcely water to be had for washing or cooking. Fear of fire produced a very panicky feeling. It is not known how long it will take to repair the break. N. J. Welton, of the Water Board, intimates that about \$37,500 will have to be expended in proper extensions of iron mains to obviate the recurrence of such breakages.

GREENSBURG, PA.—The Westmoreland Water Company, of this place, was chartered this week. Senator Meredith, of Armstrong County, is a member of the company. It is reported that a New York company is also prospecting to build water-works here.

DURHAM, N. C., has contracted for water-works.

ALBANY, N. Y.—Finally terms have been agreed upon between the Special Water Commission and Andrews Bros., of New York, for a system of driven wells to be located on Van Rensselaer Flats. Work on the new plant will be begun April 1, 1887, and it is to be completed in 120 working days. The supply must not be less than 10,000,000 gallons of water daily. The total cost of the new plant will be about \$444,000. The Andrews Brothers will be paid \$310,000 for the pumping-stations, engines, etc., \$20,000 will be set aside for the land, and \$114,000 for the 36-inch conduit and placing the same. The conduit will have to be constructed under the canal, and can only be placed with great difficulty.

GREENVILLE, S. C.—Julius C. Smith, Theron Earle, James T. Williams, and J. M. McGee have formed a company at Greenville, S. C., with a capital of \$100,000, to build water-works.

TOLEDO, O.—Tests of the new pumping-engine will not be made before January 1.

WATER COMPANIES.—The Saugerties Water Company, Saugerties, N. Y., has been incorporated. Capital stock, \$100,000. Joseph M. Low and others, incorporators.

The Baraboo Water-Works Company, Baraboo, Wis., has been incorporated. Capital stock, \$100,000. President, Jacob Van Orden.

TORONTO, ONT.—The Chairman of the Board of Works has advertised for bids for straightening the River Don, including piling, dredging, bridging, etc. Plans and specifications can be obtained of the City Engineer. William Carlyle is Chairman of the Board of Works.

SEWERAGE.—The Maryland State Board of Health has just reported on the need of a sewerage system for the Hospital for the Insane, at Spring Grove, insisting that a system must be built. Dr. C. W. Chancellor, of Baltimore, is Secretary of the State Board of Health.

LANCASTER, PA., SEWERAGE AND WATER-SUPPLY.—City Engineer S. C. Slaymaker, on November 4, presented to City Councils his report on sewerage for the northern and eastern sections of the city. He presents three plans, one of them including extensive tunnel work, and another requiring a change in the water-works intake, involving the laying of 13,000 feet of 3-foot iron mains. A third plan avoids the tunnel and change of intake, but is the most expensive, reaching an estimated cost of \$111,160. The second plan will cost, with tunnel, \$96,044. Councils have the report in consideration.

WINONA, MINN., SEWERAGE.—At the meeting of the City Council, November 3, the committees of the Council and Board of Health on sewerage reported in favor of securing an engineer to prepare plans and estimates for a sewerage system. After some debate Alderman Nagler made a motion, which was carried,

authorizing the council committee to engage the services of an engineer to go to Winona, make a survey, and aid the committee in taking the steps necessary to secure a sewerage system.

DRAINAGE WORK.—Until November 25 the Commissioners of Special Drainage District No. 1, Onarga, Douglass, and Danforth Townships, Iroquois County, Ill., will receive proposals for drainage ditches. There will be about 25 miles of such ditches, width of bottom 5 to 10 feet, slope 1 to 1, average depth 6 1/8 feet.

ELMIRA, N. Y.—The arbitrators in the differences between the contractors on the Fifth Ward sewer, P. Murray & Co., and the city have reported that it would be impossible for any contractor to comply with the specifications, and ask Mayor and Council to give the arbitrators power to certify that, although not according to the specifications, the sewer is serviceable and durable and equal to the duty required of it. The necessary authority has been given.

LAND IMPROVEMENT AND DREDGING.—A project, involving the expenditure of \$90,000 to \$125,000, is just about to be undertaken by P. T. Barnum, the "showman," of Bridgeport, Conn., on a 45-acre tract of lowland near Sea Side Park, Bridgeport. A channel is to be dredged in Cedar Creek and the material put on the low ground as filling. A contract has been awarded to the Brainard Bros. Dredging Company of New York, and work will be begun as soon as the necessary plant can be erected. It is to be completed next summer.

MINNEAPOLIS, MINN.—The City Engineer has submitted estimates to the City Council for the First Ward sewer-tunnel, placing the cost at \$87,288, or \$1,400 per lineal foot, the length of the sewer to be 6,235 lineal feet.

The new works of the St. Anthony Falls Water-Power Company at the falls, under construction, will cost about \$100,000. Nearly 100 men are at work.

The Board of County Commissioners have been requested by the Board of Trade to give an estimate of the cost of a bridge across the Minnesota River.

A new bridge is to be built between Spring Park and Mound Park, Lake Minnetonka, across Crystal Bay.

A bridge is to be built across Shaver's Narrows, Lake Minnetonka. The Board of County Commissioners have received the following bids for the same: John Burns, \$2,919, \$3,355, \$3,630; Mount Vernon Bridge Company (iron piers), \$5,703, (wooden) \$4,990; St. Louis Bridge and Iron Co., \$4,850; F. Weinhausen, \$4,867; King Bridge Company (pile foundation) \$5,125, (iron foundation) \$6,000; Horace E. Horton (pile), \$4,990, (wooden) \$5,990; Columbia Bridge Company, (pile) \$5,700, (iron) \$6,500; Raymond & Campbell (pile), \$4,827, (wooden) \$5,720; Chicago Bridge and Iron Company, \$4,800, (wood) \$5,690; S. M. Hewitt (pile), \$4,293, (iron) \$5,100, (two spans) \$3,850; C. P. Jones (pile), \$4,780, (iron) \$5,620.

TORONTO, ONT., WATER.—The report of Messrs. W. J. McAlpine and Kivas Tully, recently sent to the Mayor, after reciting the extensive examinations made by them, gives the following summary of costs: "The result of our calculations have been, that by the construction of reservoirs in convenient positions the following quantities of water can be stored and supplied daily to the citizens at a moderate expenditure of capital, the interest of which will be considerably less than the present annual cost of pumping from Lake Ontario by means of steam powers. Rouge River, 15,000,000 gallons daily, with storage of 22,000,000 gallons; Don River, 7,000,000 gallons daily, with storage of 11,000,000; the Lake River, 5,000,000 gallons daily, with storage of 10,000,000. Total, 27,000,000 gallons daily, with storage of 43,000,000 gallons. It is evi-

dent therefore, that the districts referred to will yield a supply larger than any possible future requirement of the city of Toronto. The cost of procuring the above water-supply, including storage reservoirs, purchase of land, iron pipes, and other expenses, would be \$670,000, the interest of which, at 4 per cent., would be \$26,800 annually; less than half the cost of pumping by steam-power, which is stated in the annual report to be \$60,000. This annual cost (\$60,000) at 4 per cent. would represent a capital of \$1,500,000, with probably further increases for additional pumping power, the construction of a new suction-pipe across the Bay, estimated at \$280,000, a new reservoir, and other unforeseen expenditure."

PHILADELPHIA.—On November 2, Chief Engineer Ogden presented to the Water Committee of Councils the final report of Mr. Rudolph Hering, on the future water-supply of the city. It says that the Blue Mountains must remain the ultimate source of supply, but for an earlier future, to secure 200,000,000 gallons (a liberal allowance, being double the present consumption), the water should be delivered 170 feet above the proposed Cambria basin. The aqueduct and plant will cost \$19,622,543. If only 120,000,000 gallons are pumped, about \$4,000,000 can be saved on the plant. Gravity supplies can be had without pumping from the Perkiomen or Tohickon and Neshaminy; but the supply absolutely reliable at all times will be only 150,000,000. The cost from the Perkiomen will be \$13,674,493; from the Tohickon and Neshaminy, \$13,846,662. A combined gravity (Tohickon) and pumping (Delaware) scheme is also practicable, but in minimum years only 80,000,000 gallons can be depended upon; cost, \$12,695,941 by water power, or \$17,717,025 by steam. The present supply, 90,000,000, might be obtained by pumping from the Delaware at Lardner's Point, or Point Pleasant, or from the Neshaminy. That might be done for ten or twelve millions, but to supply 150,000,000 gallons most cheaply the Tohickon and Delaware water should be used, the pumping being done by water power; but to increase the quantity to 200,000,000 the Point Pleasant scheme saves most money and supplies the best water. Whenever good water can no longer be got from Lardner's Point the aqueduct must be built on to Point Pleasant, pump by water-power and store Tohickon Creek water, first in a lower, then in an upper reservoir. Ultimately the aqueduct must be extended all the way to the Blue Mountains, but whether by the Lehigh or the Delaware it is not now possible to decide. If the South Mountain region preserves its present character the Lehigh will be preferable. If the Lehigh water should become unfit to drink, the Point Pleasant aqueduct could be carried on to the mountains.

GAS-WORKS, BUILDINGS, ETC.

GAS COMPANY.—Recently organized is the North Side Natural-Gas Company of Pittsburgh, which will lay mains to supply natural-gas to a circle of towns.

GAS WORKS.—The South Side Gas Company of Pittsburgh, Pa., has passed into the control of Philadelphia capitalists, represented by W. L. Elkins. The plant will be changed and enlarged, and a water-gas will be manufactured. Mr. Robert Brown, of the Gas Company, may be addressed.

NATURAL-GAS COMPANIES.—The Bellevue, Pa., Natural-Gas Company has completed its line into Bellevue. It is now sinking another well. The Chartiers, Pa., Natural-Gas Company is sinking a well at Hickory.

BEREA, O.—The Natural-Gas Company will want iron pipe to "pipe" the town, which project has been resolved upon. Work will be begun at once.

YOUNGSTOWN, O.—A large popular majority, on November 3, authorized the Ohio Gas-Fuel Company to lay mains and transact business in that city.

PROPOSALS FOR LIGHTING.—On November 5 the Cleveland, O., City Council authorized the Committee on Lighting to ask for bids for lighting the streets for 1887.

THE Harlem Lighting Company has filed articles of incorporation, with William M. Barnum, George Hoffman, and Henry B. Anderson as incorporators. The company is to manufacture and use electricity for producing light, heat, and power. It has a capital stock of \$100,000, divided into 1,000 shares of \$100 each.

GAS-WELLS.—On November 4, the village of Carey, O., voted by 269 to 32 to bond the town for funds to bore natural gas-wells.

GAS COMPANY.—The City Council of Fostoria, O., on November 5, passed an ordinance granting to the Northwestern Ohio Natural-Gas Company the right to lay pipes in the streets. Work was begun November 6.

PITTSBURG, PA.—The North-Side Gas Company, capital stock \$96,000, has been recently incorporated.

GAS PLANT.—The directors of the Chesapeake Gas Company, of Baltimore, Md., have received the sanction of the stockholders to increase the capital stock from \$1,500,000 to \$3,000,000 to make extensive additions to the plant. They will contract with H. J. Davison.

GAS TO BE USED.—On November 5 the City Council of Charleston, W. Va., voted that the streets should be lighted with gas.

KANSAS CITY.—A project to expend \$15,000 to \$20,000 on Walnut Grove Park is before the Aldermen of the Eighth, Ninth, and Tenth Wards.

PHILADELPHIA.—The Finance Committee of Councils, on November 9, decided to recommend an appropriation of \$300,000 for completion of the New County Prison, on the House of Correction grounds.

MANCHESTER.—Orders for the appropriation of funds for steam-heating apparatus for fire-engine house in West Manchester, for building a new engine-house on Webster Street (\$12,000), and for a temporary water loan of \$25,000 have passed the Common Council.

MILWAUKEE, WIS.—The Board of Supervisors have under consideration the asking of bids for heating-apparatus for the new County building.

NEW NATIONAL MUSEUM.—Prof. Spencer Baird, of the Smithsonian Institution, asks Congress to appropriate \$250,000 for the construction of a new building for the institution.

RAILROADS AND CANALS.

STREET RAILROAD.—Gustav Futro petitions the Board of Supervisors, at San Francisco, for the right to construct a street railroad in First Avenue.

MILWAUKEE, WIS.—There is said to be strong prospect that a \$250,000 viaduct will be built over the Menomonee marsh at Washington Avenue.

LEHIGH VALLEY RAILROAD.—It is said that an extension of this road from Mauch Chunk, Pa., to Ohio will be made, involving an expenditure of \$15,000,000. The Philadelphia *Inquirer* states that a prospectus will be issued in a few days.

NEW RAILROAD.—November 11 General Anderson, Chief Engineer of the Northern Pacific Railroad, met a commission in Chicago to consider the building of extensions, including the Helena and Northern. Work will be pushed.

RAILROAD CONSTRUCTION.—James H. Bullard, General Manager, Pacific Junction, Ia., will receive bids for the construction of the Chicago, St. Louis and Pacific Railroad; bids to be for 25 miles or more.

MILWAUKEE.—(By telegraph.)—The contract was let Monday to Harrison and Green, of Milwaukee, for extension of the Milwaukee and Northern Railroad from Iron Mountain City to Republic, forty-five miles.

STREET RAILROAD.—It is proposed to build a Twenty-eighth and Twenty-ninth Streets cross-town railroad in New York City, and the Aldermen have reported favorably.

THE Duluth, South Shore, and Atlantic Road is a new railroad organization in Duluth. It is understood contracts for construction have been let.

STREET RAILWAY.—Address James Graham, Superintendent, in reference to work on the Schenectady Street Railway, work having begun November 8.

RAILROAD EXTENSION.—Address A. F. Breed, Lynn, Mass., President of the Lynn Street Railway, in reference to extensions of the Stonehaven Line, which will be begun at once.

STORM KING BRIDGE.—The Lehigh, Hudson River, and New York, Ontario, and Western Railroads, on November 10, signed an agreement with General Manager Swan, of the Bridge Company, to aid in constructing this bridge over the Hudson River.

PHILADELPHIA.—Engineer John Deery, of the Underground Railroad project, has prepared plans, and was this week before Councils Committee.

CHICAGO.—A bridge over Chicago River at Dearborn Street is projected by the Chicago and Northwestern Railroad Company.

NEW RAILROAD.—Jeff Lane, W. W. Collins, and W. B. Sparks, all of Macon, Geo., are the incorporators of a railroad to be built on the Georgia Line to the Kissimmee River, under the name, the Macon & Florida Air Line Railroad Company.

ST. PAUL, MINN.—The Minnesota and Northwestern Railroad contemplates running a spur-track through Langevin's second addition, West St. Paul.

CHICAGO.—The Rock Island Railroad Company is credited with the determination to build over its tracks clear to Blue Island an elevated road.

STILLWATER, MINN.—The City Council has decided to practically rebuild the bridge. An outlay of about \$10,000 has been authorized.

DULUTH, MINN.—Surveys are being made at Grassy Point for the St. Paul and Duluth and Manitoba railroad bridge across the St. Louis. It is again said that the Omaha is getting ready to put up a bridge as soon as an act of Congress can be obtained, giving the necessary permission.

THE Oxford and Kansas Railroad Company has been incorporated at Lincoln, Neb., to build a road from Oxford to the State line. It is backed by the Burlington and Missouri Railroad.

CINCINNATI.—Surveying for the Vine Street Cable Road has begun, and the construction will be pushed under direction of Mr. H. M. Lane, who has been engaged for the work by the Cincinnati Street Railroad Company.

ORDWAY, DAK.—The North-western Construction and Improvement Company of Minneapolis has contracted with the Ordway, Bismarck, and North-western Railroad to build 150 miles of way to the coal fields of McLean County.

NEW RAILROAD.—The Youngstown, O., and Beaver River Railroad Company was organized, November 3, to build a road from this city south-east to the Pennsylvania line. The incorporators are Caleb B. Wick, Henry O. Bonnell, H. M. Garlick, Henry Tod, and Henry Wick.

FALL RIVER, MASS.—The contract for the iron roof of the City Hall has been awarded to Post & McCord for \$7,720. The iron-work for second, third, and mezzanine floors and ceiling of the fourth floor, including iron columns, window lintels, and arch beams, has been awarded to the Providence Architectural Iron and Metal Works, for \$16,986.

HOUSTON, TEX.—Address the Houston and Texas Central Railroad in reference to the building of a large union depot here.

BROOKLYN.—Messrs. Austin Corbin & Richardson, proprietors of the proposed Atlantic Avenue Elevated Railroad, had a hearing last week before the Railroad Committee of the Board of Aldermen.

NEW RAILROADS.—The Delaware, Lackawanna and Western have surveyed a line of road near Milton, Pa., to the soft coal regions of Centre County. James Archibald, Scranton, Pa., is the chief-engineer of the road.

THE Kansas City Metropolitan Street Railway Company has let three large contracts for iron-work on the extension of the Fifth Street Cable Line and the new Twelfth Street Line. W. B. Knight is engineer of the company.

THE Southern Kansas Railway of Texas has just been chartered to build a line of road from Fort Worth to the line of New Mexico, with branches; total length of proposed lines 590 miles. The incorporators are A. A. Robinson, George R. Peck, J. F. Goddard, H. C. Clements, N. L. Gage, W. C. Campbell, A. A. Hurd, E. Wilder, of Topeka, Kan.; George Sealy, Webster Snyder, Waters S. Davis, of Galveston, Tex.; W. B. Strong, O. T. Burr, A. W. Nickerson, Alden Speare, of Boston, Mass.; R. S. Willis, of Galveston.

THE Philadelphia Elevated Railroad has been killed for the present by the defeat of the ordinance in Council, November 5.

HARLEM RIVER BRIDGE.—The Bridge Commissioners ask the New York City Board of Estimate and Apportionment for \$250,000 for work done before January 1, 1887.

BIDS OPENED.

SACRAMENTO, CAL.—On November 1, the Board of Supervisors opened bids for a bridge over the Cosumnes River, at Michigan Bar, as

follows: E. E. Barry, \$3,445; J. F. Bohn, \$3,150; B. McMahon & Co., \$2,895; Carle & Croly, \$3,600; American Bridge and Building Company, \$3,400; McKimmon & Tumulty, \$3,900, and King Iron Bridge and Manufacturing Company, \$2,785. The King Iron Bridge and Manufacturing Company being the lowest bidder, were awarded the contract. The successful bidders have recommended the construction of an iron bridge, and will report to the Supervisors on this question.

MINNEAPOLIS, MINN.—A called meeting of the Library Board has been held, at which the contracts for the completion of the new building were awarded to Messrs. Selden & Chalker of this city. The cost of the carpenter work will be \$50,000, and the mason work \$61,000, or a total of \$111,000 for the two items. In addition to the above, the sum of \$16,000 will be expended in providing the furnaces, heating apparatus, and \$5,000 more have been expended on the completion of the foundation walls, making a total of \$132,000 for the four branches of work.

ST. JOHN LAND COTTAGE CONTRACTS.—After a long delay the Chairman of the Kings County, N. Y., Board of Supervisors, John Y. Kane, on November 6, signed the contract made with James W. Birkett, of Brooklyn, for constructing sixteen cottages at the County Farm, at St. Johnland, at \$117,000. Mr. Kane gives as his reason for delay defects in the specifications which would have led to serious misunderstanding between the county and the contractor had not modifications been agreed to between the parties. It is understood a satisfactory agreement was reached with Mr. Birkett, and then the contract was signed.

NEW YORK.—Bids for removing the pier at the foot of West 40th Street and Hudson River, and for building a new wooden pier, were opened by the Dock Commissioners last week, as follows: John W. Flaherty, \$55,102; Joseph Walsh, \$50,000; William P. Kelly, \$65,800; Richard Cronin, \$39,440; James D. Leary, \$54,390; P. Sanford Ross, \$44,500.

CHICAGO.—The contract for constructing the iron lighthouse on the north-shore inlet crib has been awarded to the Keystone Bridge Company.

TOPEKA, KAN.—The following bids for furnishing iron-work for State Capitol Building were received by Mr. George Ropes, Nov. 3: Etna Iron-Works, Chicago, \$19,250; Seaton & Lea, Atchison, \$17,387; Henry Bennett, Topeka, \$17,238; Snead & Co., Louisville, \$16,887; Haugh, Ketchum & Co., Indianapolis, \$16,757; Missouri Valley Bridge and Iron-Works, Leavenworth, \$16,359; Dearborn Foundry Company, Chicago, \$15,979; P. E. Lane, Chicago, \$15,666 (bid accepted).

BRIDGEPORT, CONN.—The Court-House Committee has awarded the contract for building the court-house to A. B. Treat, of New Haven, Conn., at \$109,500.

THE contract for constructing an iron railroad bridge over the Missouri River, at Randolph Bluffs, Mo., near Kansas City, has been awarded to the Keystone Bridge Company, of Pittsburgh, and M. Lassig, of Chicago, at \$700,000.

ROCHESTER, N. Y.—The Executive Board has awarded contracts as follows: Goodman Street gravel improvement, estimate \$10,800, to Thomas Oliver & Son, \$9,780.90; Mansion Street grading and plank walk, estimate \$3,050, to Thomas Oliver & Son, \$2,716.30.

MANKATO, MINN.—The Building Committee of the County Commissioners has awarded the contract to Ring & Tobin at \$28,800 for enclosing the court-house. The other bids were as follows: William Van Voise, \$39,300; Thomas Russell, \$65,755; Frank Fowler, \$37,500; W. B. Craig & Co., \$34,887; O. R. Mather, \$36,600. The contract provides for the completion of the work under this contract by the 1st of August, 1887.

THE City Council has decided to leave the whole matter of a new contract with R. D. Hubbard & Co., and the contract for laying of water-mains with the committee on water-works. The representatives of several different pipe concerns were before the council, setting forth the advantages of their kind of pipe, but as to whether the pipe was to be of iron, wood or cement was left with the committee.

GARBAGE REMOVAL.—On November 4, proposals for removal of garbage from the city of Brooklyn for a term of five years or less, were opened by the Departments of Health and City Works, as follows:

BUILDING INTELLIGENCE

BROOKLYN.—The Greene Avenue M. E. Church will build a \$50,000 edifice on Summer Avenue and Van Buren Street.

Jeremiah Johnson will build a \$14,000 br store and dwell on Pacific st, near New York av.

Charles Hart has the contract for building five temporary relief buildings at St. Johnland.

The Willoughby Avenue Baptist Church Committee has decided to build on Greene av, between Lewis and Stuyvesant avs. Plans by architect L. C. Holden, of New York; cost, \$50,000. Rev. R. B. Montgomery is pastor.

BUFFALO, N. Y.—The Terrace, morgue; cost, \$6,000; o, City of Buffalo; a, H. H. Little; b, John Druar.

Linwood av, br res; cost, \$10,000; o, E. B. Smith; a, F. W. Caulkins.

Linwood av, stone and br res; cost, \$25,000; o, Mrs. L. L. Crocker; a, F. W. Humble; b, J. H. Tilden.

Hodge av, frame res; cost, \$8,500; o, John D. Larkin; a, W. W. Carlin; b, Jacob Jaekle.

CHATTANOOGA, TENN.—Recently organized is the Dowling Furnace Company, capital \$200,000, to build iron furnaces here. J. F. Shipp, of Temple & Shipp, can give information.

CINCINNATI, O.—Pres. church; cost, \$2,500; o, Maderia, O.; a, Forbush & Green.

State st, Walnut Hills, 2 br dwells; cost, \$11,000; o, Matt Ryan; a, same as above.

8th st, nr Sycamore, Hamilton Co. morgue; cost, \$12,000.

COLLEGE HILL, O.—Fr dwell; cost, \$5,000; o, L. E. Arken; a, Forbush & Green.

Fr dwell; cost, \$5,000; o, Alex. Reid; a, same as above.

CHICAGO, ILL.—125-27 Clinton, br warehouse; cost, \$16,000; o, J. Tucker.

1284-1312 Wilcox av, br dwell; cost, \$30,000; o, C. Barker.

38-66 North av, br factory and engine house; cost, \$18,000; o, Chicago Sash, Door and Blind Co.

27-31 Bixley, br dwell; cost, \$30,000; o, Houghteling & Ryerson.

704-08 W 12th, br store and dwell; cost, \$10,000; o, Wolf & Krump.

3635-39 Prairie av, br dwell; cost, \$14,000; o, L. Duckrow, a, J. H. Carpenter; b, Proctor & Hood.

1619 Indiana av, br dwell; cost, \$10,000; o, D. E. C. Dudley.

42 Green st, br stables; cost, \$11,000; o, Bremer & Hoffman Brewing Co.; b, W. A. & A. E. Wells.

711 N Hoyne, br dwell; cost, \$10,000; o, A. Ochs.

CAMDEN, N. J.—In progress: William H. Fay, br factory, 24x80 feet, two stories high, at Point and Elm sts. C. W. Cox, 16 2-story br dwells, on 10th st, bet Penn and Linden. He has taken up building permits for 10 more on Chester st. Wilmon Whildin, 2-story br store, 20x100 feet, at 528 Market st. Scudder & Budd, 10 2-story br dwells, at 3d and Beckett sts. Roberts & Cohn, finishing 25 2-story br dwells, at and near 7th and Royden sts. S. B. Goff, 2 first-class 3-story br dwells at Bridge av and Broadway. Wilson Ernst, 7 3-story br dwells, on Washington st, east of 4th. Geo. Holl, 18 3-story br bldgs, 6th and Washington sts. David B. Kaighn, 4 br dwells, 3d and Mt. Vernon sts. Maybury E. Harden, 2 3-story mansard roof dwells, Locust and Mt. Vernon sts. Eli B. Morgan, 12 2-story br dwells, near 2d and Mt. Vernon, and 4 more on the n e cor of 2d and Mt. Vernon sts. Randal E. Morgan, 2 br dwells, 205-207 Sycamore st. Hall Officer Sylvester Kelly, extensive store and dwell, 6th and Spruce sts. H. A. Gill, 2 br bldgs on the old Crump property, 528-530 Davidson st. Councilman Thomas Harman, 2 br dwells; Ferry av, near Master st. William Anderson, 7 fr dwells, 7th and Florence sts. Robert Kaighn, 14 2-story br dwells for Zophar C. Howell, near Broadway and Jefferson st.

CHATTANOOGA, TENN.—J. R. Ryan will build a \$5,000 residence, also will J. D. Dobbs. F. C. Caldwell will build a br block on Penelope and 9th streets. Mrs. M. T. Garvin will build a br store on 9th st.

BUILDING INTELLIGENCE.

DENVER, COL.—Broadway, stone church; cost, \$90,000; o, 1st M. E. Church; a, R. Roeschlaub; b, not let.

Broadway, br and stone terrace; cost, \$18,000; o, C. J. Clarke; a, Edbrooke & Co.

Broadway, br and stone church; cost, \$35,000; o, Unitarian Church; a, same as above.

Arapahoe st, 3-story block br and stone stores; cost, \$38,000; o, T. Patterson; a, same as above.

Colfax av, br and stone res; cost, \$12,000; o, R. Curtis; a, Varian & Sterner.

Broadway, stone res; cost, \$6,000; o, J. A. Fleming; a, same as above.

Broadway, stone business block; cost, \$8,000; o and a, same as above.

DETROIT, MICH.—23 Winder, br barn; cost, \$11,000; o, J. Sowerley; a, W. Scott & Co.; b, P. Dee.

362 W Fort, br store; cost, \$10,000; o, J. Pridgeon, Jr.; a, A. C. Varney.

DULUTH, MINN.—The contract for the erection of the new Duluth National Bank Block will be let to Moore & McMillan, of St. Paul, the lowest bidders. The amount of the bid is in the neighborhood of \$100,000.

The contract for building the Duluth, Huron, and Denver road has been let to A. L. Evans, of Chicago, to be completed and ready for business September 1, 1887.

DENVER, COL.—In progress, Church of the Unity, Clement av and Broadway. Corner stone laid November 6.

EAU CLAIRE, WIS.—Address England & Thomas about new buildings, etc., at their logging camp at Chippewa.

ELGIN, ILL.—Contracts open on the building of the new opera-house. Address Mr. Dubois, Dubois Block.

ELBERTON, GEO.—The Methodists are talking of building a church here.

FORT SMITH, ARK.—Jail; cost, \$50,000; Jas. H. Reid, superintendent.

Cumberland Presbyterian Church; cost, \$6,000; a, J. S. Skidmore.

HARTWELL, HAMILTON CO., O.—A \$26,000 school house will be built here.

JERSEY CITY, N. J.—Mr. P. W. Wittpenn is erecting a 3-story fr house, on Cambridge av, for H. Wolf. Charles Hoymire is building a 2-story dwelling for Mr. A. Adrics on Irving st. William Hackett is at work on a 3-story flat, on Central av, near Congress st. Martin Hackett is building a small hotel on Summit av, near Charles st, for Philip Dittmar. J. Pforr is erecting a dwelling for W. Densey, on Lincoln st, near Summit av. Hamilton & Banks Bros. are building for themselves a 3-story flat on New York av, near Bowers st. H. Hellmick is building a 2-story dwelling on North st, near Central av.

LOCKPORT, N. Y.—Pine, cor Walnut st, br hotel; cost, \$12,000; o, C. W. Mossell; a, W. W. Carlin, Buffalo, N. Y.; b, W. E. Huston.

MANSFIELD, O.—In progress: the Intermediate Penitentiary building, corner stone laid November 4; estimated cost, \$1,500,000.

MILWAUKEE, WIS.—George A. Spence & Co. will erect a fine store on Grand av, near 2d st, on leased ground from J. H. Tweedy; the cost is estimated at \$10,000.

Capt. John Fitzgerald is erecting a double house on Ogden st, near Astor, to cost about \$8,000.

In progress: Baptist church, cor of Wells and 17th st.

The congregation of the Perseverance Presbyterian Church, Cor of Walnut and 18th sts, have this week completed the work of making a new foundation and enlarging the church edifice.

MINNEAPOLIS, MINN.—2845 Garfield av, addn. grain elevator; cost, \$12,000; o, D. R. Putnam; b, Wm. Watson.

R R land, s e Minneapolis, elevator; cost, \$20,000; o Memphis Union Elevator Co.; b, day's work.

1616 Chicago av, br dwell; cost, \$8,000; o, P. J. E. Clementson; a, C. F. Struck.

BUILDING INTELLIGENCE.

MINNEAPOLIS, MINN.—J. H. Thompson will erect a \$10,000 store building on North 15th st.

The foundations for Mrs. Mead's rustic lodge in Washburn Park are going in. It is to be built of logs at a cost of \$10,000.

W. H. Hinkle is building an elegant residence in 10th st, opposite 7th av south. It is in the colonial style, of brick, with Kasota stone trimmings, and will cost \$18,000.

1309 Madison st, N E, church bldg; cost, \$5,000; o, Baptist Church Society; b, W. H. Borman.

Cor 38th st and 11th av, dwell; cost, \$6,000; o, C. Reim; a, Stranahan Bros.

714-20 Hennepin av, br theatre; cost, \$140,000; o and b, Gates Bros.; a, J. M. Woods.

600 Nicollet av, br stores; cost, \$7,000; o, N. F. Griswold; a, C. S. Sedgwick.

622 6th st, S, br stores; cost, \$6,000; o, J. H. Perkins.

1903 Portland av, br church; cost, \$55,000; o, 1st Presbyterian Church; a, W. H. Hayes; b, Geo. Summers.

43 15th st, N, br dwell; cost, \$10,000; o, J. H. Thompson.

512 E 14th st, br dwell; cost, \$6,000; o and a, C. G. Rollins; b, J. H. Ralph.

71 Nicollet st, br warehouse; cost, \$15,000; o, S. M. Rich.

242 Plymouth av, br store; cost, \$7,000; o, J. Mitwer; b, Wilkins & De Armond.

MINNEAPOLIS, MINN.—The First Presbyterian Society, in its building application, estimates the cost of its new church at \$55,000.

J. H. Perkins will put up a double br veneer building for stores at 422-24 6th st south, to cost \$6,000.

R. S. Tuttle and Joseph H. Murch will erect a large br building in the spring on Hennepin av, between the West Hotel and the new Masonic temple.

The foundations for the new German Methodist church, cor of 13th av south and 18th st, are in, and work upon the superstructure will be carried rapidly forward. The structure will be of pressed brick veneer, and will cost from \$10,000 to \$12,000. The style of the architecture is a modified form of English Gothic. The ground dimensions are about 70 by 72 feet.

Mr. Beny, the banker, is putting up a fine building at the cor of 2d av south and 3d st. It is to be of red pressed brick, with red stone trimmings, and will cost \$75,000 to \$100,000. It ground dimensions are 86 by 58 feet.

NEW YORK.—Hugh N. Camp proposes to convert the Ittner's Hall into a modern place of amusement. The site is 177th st and Vanderbilt av, in the annexed district.

NEW YORK.—The German Odd Fellows' Home Association has been incorporated to erect a home for indigent Odd Fellows.

NEW YORK.—John B. Hillyer will build a \$100,000 apart house an 4th av and 60th st.

The Prospect Hill Reformed Church will build a \$20,000 edifice on 89th st, near Park av.

NEWPORT, R. I.—In progress: mortuary chapel in Island Cemetery.

OSHKOSH, WIS., will have a U. S. building on a site at the cor of Main and Washington sts.

PHILADELPHIA, PA.—206-210 Square st, 3 dwells; o, John Escandel.

Jefferson, bet P. R. R. and Mercer, 2 dwells; b, Chas. W. Rufe.

Marshall, bet Tioga and Venango, 6 dwells; b, Geo. F. Gibson.

Palethorp, above Lehigh av, 2 dwells; b, Jas. Galbraith.

33d, bet Master and Thompson, 4-story br store house; b, Harbach & Auchter.

Hutchison, n Huntingdon, 8 2-story dwells; o, John Loughran.

Arch, bet 21st and 22d, 5 dwells; b, Wm. H. Abbott.

Locust, bet 6th and 7th, 3-story br office; b, Wm. Devitt & Son.

15th and Fountain, 4 3-story dwells, 1 2-story dwell, and 1 br stable; b, Chas. Martin.

BUILDING INTELLIGENCE.

PROVIDENCE, R. I.—Comstock av, frame dwell; o, Andrew Comstock; a, Gould & Angel; b, R. Patterson.

ROCHESTER, N. Y.—Timothy Whalen will erect a br block on Otsego st, near Allen st; cost, \$14,000; architects, Warner & Brockett; contractor, John Keener.

Frank Ritter will build a new block on the bluff north of Vincent Place bridge, for manufacturing purposes. Putnam & Block are architects.

The Rochester Plow Company will build works near Culver's Woods, East Rochester, of brick, cost \$10,000. James Fay is architect.

ST. LOUIS, MO.—Clara and Maple av, fr dwell; cost, \$6,000; o, Col. E. S. Pike; b, C. Johnson.

Sullivan and Prairie av, br dwell; cost, \$9,100; o, D. F. Jewett; a, P. F. Meagher & Son; b, W. J. Hegel.

15th and Poplar, br factory; cost, \$6,000; o, Mrs. Dwyer; b, T. Lowery.

20th and Randolph st, br store house; cost, \$32,000; o, W. A. Wood; b, T. Lowery.

Cook and Grand av, br dwell; cost, \$6,000; o, J. S. Dowling; b, Bryan Brady.

ST. PAUL, MINN.—It is understood on good authority that a large and expensive theatre is probably to be erected in this city. Mr. J. B. McMurrin is said to be interested in the enterprise. Hodgson & Stern, architects, have been working on plans for it.

James H. Drake will build a 10-story storage warehouse. The excavation for the foundation is already done. The cost is to be \$35,000. Active work will be begun in the spring.

Hodgson & Stern, architects, are working on plans for a hotel to be located in West St. Paul, to be built by A. B. Wilgus at a cost of \$25,000. It will be 125 feet deep by 96 long, of brick and wood, having a court in the centre.

Ramsey, bet Pleasant and Western av, fr dwell; cost, \$5,000; o, A. Brown.

Dayton's Bluff, nr Mississippi, coal chute; cost, \$5,500; o, C. B. & N. R. R.

Lauree, bet Kent and Dale, frame dwell; cost, \$5,000; o, L. P. Reinhardt.

SAN ANTONIO, TEX.—Dwell; a, J. R. Gordon; o, Mr. Campbell; con, Huffaker & Massey Bros.

ST. LOUIS, MO.—9th and Arsenal st, br stock house; cost, \$50,000; o, Anheuser & Bush; a, E. Yungenfeld; b, sub-let.

8th and Locust st, br office bldg; cost, \$50,000; o, J. M. Thompson; a and b, same as above.

15th and Market st, br school bldg; cost, \$20,000; o, Libbins School; a, O. W. Wilhelm; b, Bothe & Ratterman.

Jefferson and Clark av, br bldg; cost, \$11,000; o, P. & B. Pollock; b, A. Wagner.

11th and Olive st, br office bldg; cost, \$12,000; o, J. G. Carton; a, J. D. De Pombray; b, H. E. Friday.

TEXARKANA, ARK.—3-story br hotel; o, J. F. Smith & Co.

WASHINGTON, D. C.—T, bet 14th and 15th, 4-story br bldg; cost, \$50,000; o, Mexican Govt.; a, A. B. Mullett; b, Jno. McGregor.

Conn av and R, 3-story br bldg; cost, \$16,000; o, David Smith; a, T. F. Schneider.

Boundary, bet V and W, 6 2-story br bldgs; cost, \$20,000; o, D. J. McCarty; a, same as above.

R I av, bet 9th and 10th, 3-story br bldg; cost, \$5,000; o, J. Bartlett; a, James H. Grant.

Mass av, bet 17th and 18th 3-story br bldg; cost, \$16,000; o, Jno. Sherman; a, F. G. Atkinson; b, Jno. Sweeney.

K and Del av, 7 2-story br bldg; cost, \$5,600; o and a, Jas. H. Grant.

16th, bet T and U, 2-story br bldg; cost, \$4,000; o, C. Baylis; a, C. H. Willett.

McLean av, 6 2-story br bldgs; cost, \$5,400; o and a, B. H. Warner & Co.

Fifty-three permits less than \$5,000 in value.

WORCESTER, MASS.—Fruit st, fr dwell; cost, \$8,000; o, E. A. Kelley; a, Fuller & Delano; b, not let.

Lamartine st, alteration of factory bldg; cost, \$4,000; o, T. J. Maney; a, Barker & Nourse; b, not let.



THE DEER ISLAND HOSPITAL, OF BOSTON.

The accompanying plans, etc., illustrate the general arrangement and the heating and ventilation of the new hospital at the House of Industry (Deer Island), city of Boston.

The block plan, Fig. 1, shows all the buildings and the corridors connecting them. Of the four pavilions shown three are built, the one on the extreme left (a male ward) being omitted for the present.

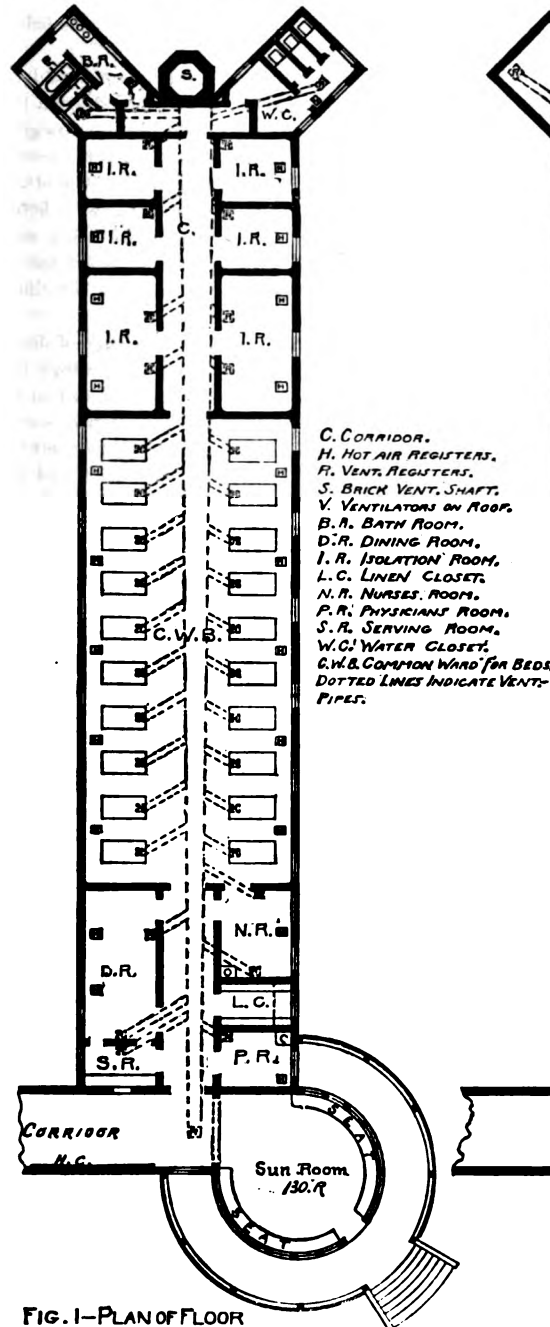


FIG. 1—PLAN OF FLOOR

Cellars are provided under the administration building and the centre or kitchen wing, but the remaining buildings are set on brick piers with stone footings—a depth of four feet being maintained between the floor-joists and the ground.

The buildings are of wood, the studding, etc., being spruce. The principal outside studding, sills, posts, plates, headers, etc., are pinned with oak, and other scantlings are nailed or spiked. The buildings that rest on piers have trussed sills. The covering boards are 5-inch mill-planed spruce. The floors are 2½-inch wide, kiln-dried, matched hard pine boards, laid on 5-inch wide matched spruce, between which is one thickness of sheathing-paper, on which is laid one thickness of heavy (Beaver brand) felting-paper. All outside boarding, including roofs, are covered with one thickness of felting-paper. The outside finish is clear pine, and the clapboards are laid four inches to the

weather. The roofs are shingle. The walls are double plastered.

The pavilions are 128 feet long and 28 feet wide. At the entrance to each from the corridor is a serving-room and dining-room for patients, and opposite these the nurses' room, linen-room, and physicians' examination-room.

The isolating rooms, and larger rooms for four beds, for patients not to be trusted with the freedom of the open ward, are placed at the further end of the pavilions. On the female side the open ward is sixty-three feet in length; on the male side, where greater restraint will be necessary, this is reduced by the addition of more single rooms to thirty-eight feet.

The walls throughout are hard-finished. All angles and corners are rounded out; the same also has been done by suitable molding at the junction of the base-board with the floor, to avoid places favorable to the accumulation of dirt and dust.

The bath-rooms and water-closets have been located as far as possible from the wards. They are situated at the extreme ends of the pavilions.

With regard to ventilation, it is assumed that in the summer months, the location being extremely favorable, thorough ventilation may be obtained through ordinary channels, such as windows, doors, etc. For the winter, however, heating and ventilation by artificial methods are provided.

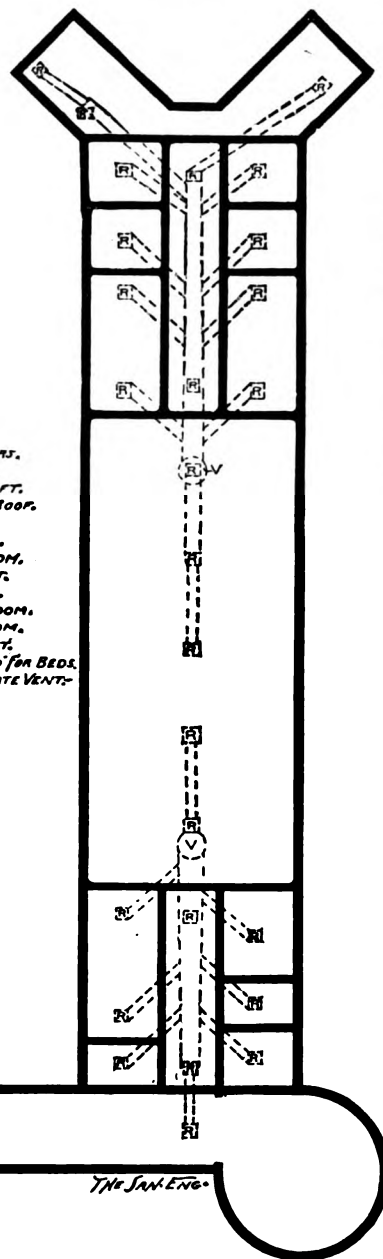


FIG. 2—PLAN OF CEILING

The air is withdrawn at the floor of each ward through a number of small registers communicating with a large central air-duct, which terminates in the aspirating-shaft at the end of each pavilion. This shaft is forty-four feet high, five feet in diameter inside, with a steam-coil of twenty 1½-inch pipes carried around it. The location of this shaft and the system of vent-ducts connecting therewith below the floor is shown in Fig. 1.

Figure 2 (ceiling plan) shows another system of vent-ducts, which connect with ventilating tops at the ridge. These, presumably, are for summer ventilation, and for use at times when the shaft (S) is not warmed. The hospital is to accommodate 136 patients, or thirty-four beds to a ward. The average height is eighteen feet, and the air-space per bed about 1,500 cubic feet.

The pavilions are fifty feet distant from each other, and this space will be arranged for an airing-court for the

patients, access being had to it through a side door in the corridor.

Three boilers, four feet in diameter by fourteen feet long, are used for heating, etc. They are placed in the centre wing under the kitchen.

Eight stacks of cast-iron indirect radiators are used for warming the large room of the female ward. They aggregate 1,412 square feet. Six similar stacks are used in the large room of the male ward; they aggregate 1,188 square feet. Direct radiation is used in some of the small rooms and in the baths and water-closets. The corridors are warmed by four 1½-inch pipes run the whole length under the windows. The sun-rooms have circular heaters at the centre of 130 square feet each.

The main steam-pipe is five inches in diameter. A 3-inch pipe supplies each pavilion, entering under the corridors. The return-pipe is smallest where the steam-pipe is largest, so they will run in the same direction and leave the building at the opposite end of the wings. The water is returned to the boilers by gravity traps. The registers used are 14x22. The ventilation-ducts are made of 3-inch wide matched and tongued clear pine, put together with white lead.

The building cost \$60,000.

The architect was Mr. Arthur H. Vinal, and the heating and ventilating contractors Messrs. Ingalls & Kendrick, all of Boston.

ENGLISH PLUMBING PRACTICE.

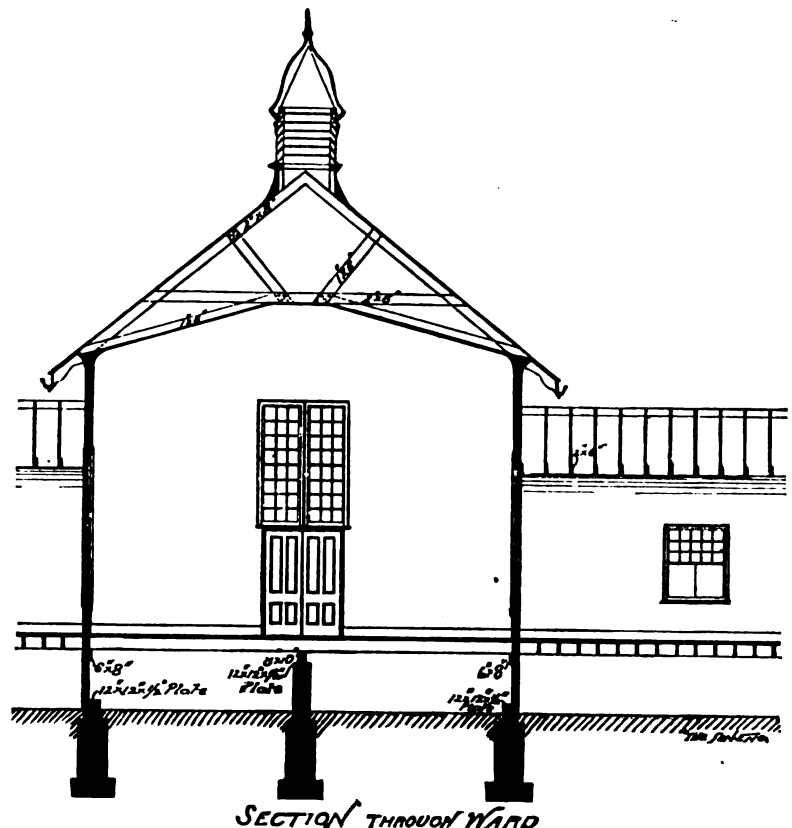
BY A JOURNEYMAN PLUMBER.

No. LXIV.

(Continued from page 497.)

SOIL-PIPES, ETC. (CONTINUED).

In last paper was described how a great many, but not all, plumbers fit up a trap and soil-pipe for a water-closet by



SECTION THROUGH WARD

the rule of thumb. I will now describe how to set out the trap and soil-pipe for a water-closet.

Figure 1 represents a plan of the opening for a single water-closet. Now, water-closets such as the valve and others which require a trap beneath them, and which have the outlet in the centre of the apparatus, require the trap to be placed central—that is, equidistant from the side walls. The distance from the back wall is governed by the depth of the water-closet seat. Some architects will have the seats 1 foot 9 inches from back to front, and others specify them to be 2 feet 6 inches, so as to leave more room for the user's dress, and also to leave room for hanging the perforated part of the seat as well as the flap. To take a medium, and the most commonly used, width of seat—say 2 feet—the trap should be fixed with the centre 1 foot 3 inches from the back wall. To mark out the work, first of all set out full size on the bench or floor the side

and back walls as shown at Fig. 1. Find the position of the trap A, and with a pair of compasses describe a 4-inch circle—that being the usual size of the inlet of traps. If the soil-pipe is 4 inches and going to be fixed in the angle as shown at B, describe a similar circle at that point. If the soil-pipe is to be $3\frac{1}{2}$ inches in diameter, or any other size, describe a circle equal to the end section of the pipe. If the soil-pipe is to be fixed in any of the positions shown by dotted lines at C, D, E, F, G, or any other position, the circle should be made in that position. The next thing is to take a piece of strong lath—say 1 inch thick by 2 inches wide—and cut it to the exact length between the two circles.

the mark of the top of the floor-joist to the pipe and also on the setting-out marks as shown at K, Fig. 2. With the small rod that was cut to an exact length, set out the distance K to L. Four inches away make another mark at M. Between these marks lay the trap so that the crown of the outgo is below the line of the floor-joist. Scribe or mark on the bench the shape of the trap, and draw parallel lines from the trap outgo to the lines representing the vertical soil-pipe, giving these lines a declination from the trap, but not allowing them to come below the line N, which represents the bottom edge of the floor-joist, the reason for this being that the pipe would look unsightly when

of the trap to enter a short distance. As a rule, the joint on the outgo of a P-trap is straight. After soiling and preparing the ends, this joint should be made. The branch-joint should then be prepared and placed in position for making, as shown at Fig. 3.

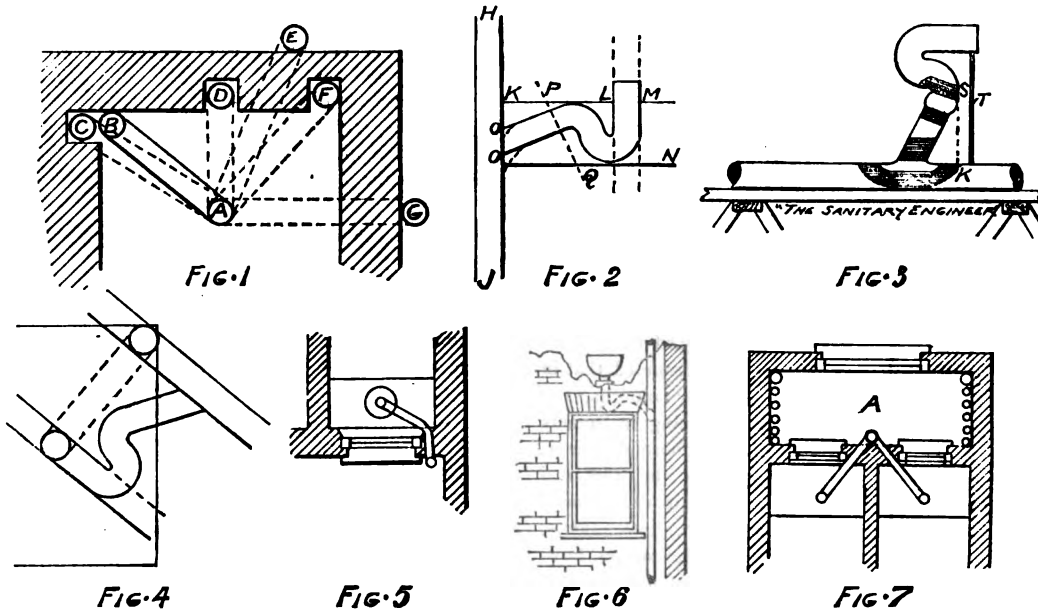
Wood blocks should be fixed inside at R, as described in the article referred to above, to support the weight of the trap and branch-pipe.

The piece of lath that was cut to the exact distance between trap and vertical pipe should be placed as shown at Fig. 3, to insure that they are the proper distance apart, and should be left there until the branch-joint is made, to prevent the trap falling forward, and also help to support the weight of it. The sides of the pipe laying on the bench should be scotched to prevent its rolling, and a piece of 1-inch pipe bent to a U-shape and laid across the trap, with the ends resting on the bench, will be found to be all that is necessary for fixing the joint until it is made; or two clout-nails can be driven into the edges of the bench, and a stout piece of string passed round the trap, the ends being fastened to the nails for the same purpose.

Before making the branch-joint, a set square should be placed on the bench-mark K, Fig. 3, and should touch the crown of the trap at S. If a D-trap is being fixed, a straight-edge laid on the flat top of the trap should touch the bench-mark K—that is, if the trap is properly fixed. The above way of setting out traps and soil-pipes is not new, it being taught to the writer when he was a lad. If taken as a problem in geometrical projection, it would be set out as Fig. 4; the dotted lines being the plan and the firm lines the elevation.

To show the value to plumbers of a knowledge of drawings, the writer a few years ago had a set of drawings of a house being built at Shanghai, in China, given to him for his guidance, as to the positions of the cisterns, water-closets, sinks, etc. The whole of the work was set out full size on the workshop floor, in London, and made and put together ready for placing in position. Brass unions were soldered on to the pipes where, of necessity, they had to be made in sections for convenience of removal or stowing away in packing-cases. Each part of the work was labeled as to its position, and the unions were all numbered for the guidance of the workmen who fixed them. The whole of the work was found to fit its intended position, and the only hitch was a delay in replacing some marble slabs for wash-hand basins and urinal-backs and stalls that got broken in transit from England to China.

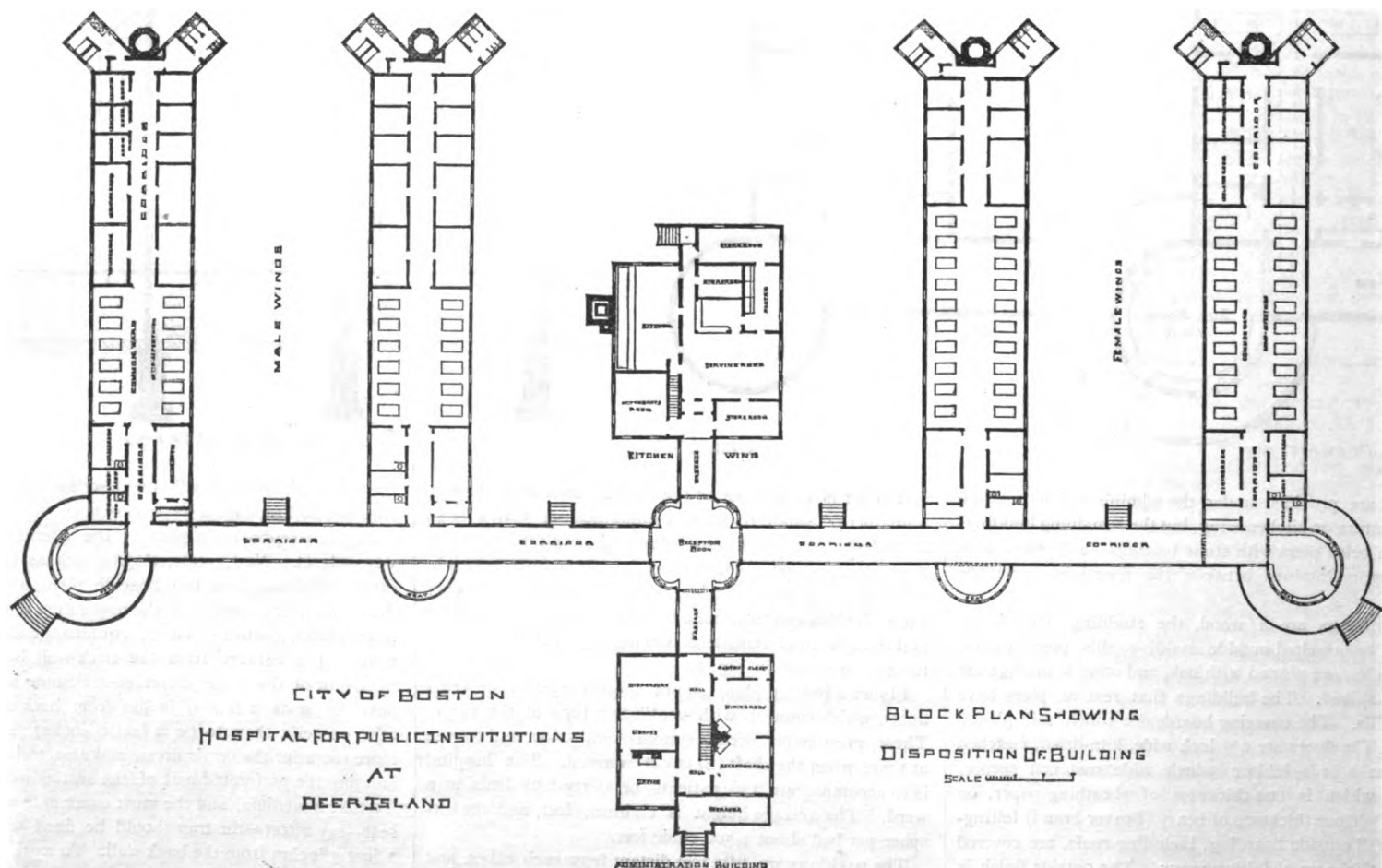
Figure 1 represents a plain setting-out for a water-closet trap and soil-pipe, but sometimes difficulties present them-



All the lines can now be rubbed out as being of no further use. The next operation is to set out a pair of parallel lines as shown at H J, Fig. 2, the distance apart being equal to the diameter of the vertical soil-pipe. Now take a long rod and place the bottom end on the drain-socket if it is for the first length, or on the top end of the last length of soil-pipe if for an upper floor, and mark on the rod the top of the floor-joist where the trap is going to be fixed. When a rule is used for taking a dimension a mistake may crop in, but by using a long rod the liability to error is minimized. Now lay the length of soil-pipe between the lines H J and measure from the bottom end with the rod, allowing half an inch for a joint at the bottom end, and transfer

seen from beneath if below the ceiling. When small soil-pipes are used it is necessary to bend the end of the branch soil-pipe as shown by dotted lines, for reasons given on page 377, Vol. IX., of THE SANITARY ENGINEER.

Marks should be made on the long length of pipe at O O, and then the hole for the branch-pipe opened between those marks. The branch-pipe can be cut the exact length, and with the end at the proper angle for connecting to the other pipe, and if properly done will not require any rasping or fitting in any way beyond what is necessary to keep the solder from running through when the joint is being made. The other end of the branch-pipe should be cut half an inch longer than the mark P Q, to allow for the end



DEER ISLAND HOSPITAL.

Gas and Electricity.

Illuminating Power of Gas in New York City.

Week ending	New York Gas-Light Company.	Manhattan Gas-Light Company.	Metropolitan Gas-Light Company.	Mutual Gas-Light Company.	Municipal Gas-Light Company.	Krickerbocker Gas-Light Company.	Equitable Gas-Light Company.
November 6	25.92	21.01	20.72	31.37	29.86	23.51	31.59

E. G. LOVE, Ph.D., *Gas Examiner.*

DIRECTORY OF GAS COMPANIES AND GAS OPERATIONS.

THE Goodwin Gas Stove and Meter Company has recently issued the fifth edition of its directory of the gas companies in the United States and Canada. Besides giving the officers of the different companies the directory contains information as to the price of gas, the number of public lamps, and the price received for lighting them, the approximate annual output, the process of manufacture, and the population of the city or district supplied. It is unfortunate that so many companies have failed to give the information asked for. It appears that there are 974 gas companies in the United States. Of these 692 companies have furnished information on the quantity of gas manufactured, and of these latter 495 manufacture coal-gas and 197 by some other process. The approximate annual output of the 495 coal-gas companies is 16,204,000,000 cubic feet, or about that of the Gas-Light and Coke Company of London. The output of the other 197 companies making returns is 5,566,000,000 feet. If we estimate the output of the companies not heard from on the basis of the population of the district supplied we find the quantity to be not far from 5,000,000,000 feet. This makes a total output by the companies of the United States of about 26,770,000,000 cubic feet. Natural-gas is not included in this.

A summary of the various processes employed is quite as interesting as the figures on the output of gas. Of the companies furnishing information on this point we find that 590 are making coal-gas. Then comes the Lowe process with 70, the Hanlon with 29, the Patton with 22, and so on through a list of some thirty or more processes, each of which is employed by from one to a dozen companies. It appears also that we make gas from wood, rosin, petroleum, naphtha, Australian shale, bituminous and anthracite coal, while many companies compound a gas from "wood and coal," "coal and oil," "wood and oil," and so on.

WHAT is believed to be the largest gas-holder in the world has been constructed by Messrs. Ashmore, Benson, Pease & Co., Limited, of Stockton-on-Tees, after designs by Messrs. George and Frank Livesey, engineers to the South Metropolitan Gas Company. The London *Engineer* describes it as follows: The height when inflated will be 174 feet, and the diameter 250 feet, and it is calculated to contain 8,250,000 cubic feet of gas. It is constructed in four tiers which telescope into one another, so that when not in use they lie flush with the ground in the concrete tank which is excavated to receive them. The area covered by the holder is rather more than one acre in extent. To keep the holder in its proper position there are twenty-eight wrought-iron standards at equal distances around it, rising to the height of 178 feet, up which the guide-rollers work, these latter being fixed on the holder. The total weight is approximately 1,700 tons, included in which is a considerable amount of steel.

A NEW electric head-light has been tested on the Pan-Handle Railroad. There are also incandescent-lamps on flexible wires which the engine-driver or firemen can use in oiling up the engine, etc. The light is said to be a success.

THE St. Paul Heat and Power Company has been organized, with a capital of \$500,000, for the purpose of boring for natural-gas. The manager of the company is confident that the venture will be successful.

It appears that the Dublin Corporation is making efforts to purchase the works, etc., of the Alliance and Dublin Consumers' Gas Company. This is not the first time either that the corporation has turned longing eyes upon the "loaves and fishes" of the gas company.

PROVIDENCE, R. I., SEWERAGE.

MESSRS. JOSEPH P. DAVIS, Rudolph Hering, and Robert Moore, appointed a commission to examine and report on the best means of disposing of the sewage of Providence, R. I., arrived in that city, Tuesday, November 2. They have considered the following possible solutions of the problem: (1) Discharge of the crude sewage into Narragansett Bay at outgoing tide; (2) Discharge into the bay at Field's Point after chemical precipitation (as recommended by Mr. Samuel M. Gray, City Engineer, in his report of 1884, with which our readers were made acquainted); (3) Purification of the sewage by filtration on the Warwick plains; and (4) Purification by irrigation on either the Warwick or Seekonk Plains. They have visited each locality, and also those which could in any way be affected by sewage discharge; have carefully examined the current observations made by Mr. Gray a few years ago to show the circulation of the water in the Providence River and Bay, and also the soil upon which the sewage could be discharged. The proposed lines for the intercepting sewer were inspected, and they are now engaged in making up the estimates of cost. Their report may probably be presented within a month.

HIGH-LEVEL RESERVIOR AT KIDDERMINSTER, ENGLAND.

WE take the following from *Engineering*: The reservoir, designed by Mr. E. Pritchard, is on the highest available site near Kidderminster, and will permit of 43 feet greater head of water than could have been obtained from the existing open reservoir near to the pumping station. The new reservoir is a covered one, and is constructed of masonry, brick-work in cement, and concrete, and is partly in excavation and partly in embankment; special care having been taken by puddling all portions of the work below the top water-level, as the ground upon which it has been constructed contains a porous subsoil. The interior of the reservoir has the following dimensions: 145 feet long, 145 feet wide, with available height of water of 14 feet 7 inches. This capacity, after making deductions for pillars and buttresses, will provide a storage of 1,850,000 gallons. The roof of the reservoir is constructed of a rolled iron girder floor and with cement concrete arches, upon which is placed some 2 feet of earth, the whole being supported by 72 cast-iron pillars. There are several inspection and air shafts. The present engines and pumps at the Stourport Road Station will supply the water to the reservoir; the water (which is of exceptional purity) being obtained from a bore-hole in the lower red sandstone (bunter) formation. The works have been most satisfactorily carried out by the contractor, Mr. George Law, of Kidderminster. The total cost of the reservoir, including the purchase of land, was approximately £6,800.

IN submitting the eighth annual report of the State Board of Health of Rhode Island, for the year 1885, the Secretary, Dr. Charles H. Fisher, remarks that the work done has been so fully reported at the quarterly meetings of the board that it is unnecessary to enter into details. The health of the State during the year has been good, and there have been very few epidemic outbreaks. Malarial diseases have been prevalent in many towns, but not more than in the preceding year. Copies of laws and circulars relating to public health matters are given, and the usual correspondence from physicians in different parts of the State is printed. The report of H. A. Bentley, City Engineer of Newport, on the completion of the sewerage of Newport, is interesting. He estimates for an iron pipe to be laid to deep water west of Goat Island, said pipe to be thirty inches in diameter, and for the completion of sewers in the town at a total cost of \$143,338.

WE are very glad to receive this commencement of another series of State health reports by the State Board of Health of Maine. One by one the States are learning that sanitary work and the furnishing information upon health matters form an important part of the duty of government, and we hope that soon every State will have its own series of health reports, and be striving in honorable rivalry to do the best work in this direction. About one-half the present volume consists of extracts from letters received from physicians throughout the State in response to a circular letter of inquiry issued by the board. When these

physicians state facts observed by them as to modes of communication of disease, or circumstances under which certain diseases have appeared in their vicinity, their reports are valuable and instructive, as may be seen from the extracts from them relative to modes of propagation of scarlet fever, which are published in another column of this number of THE SANITARY ENGINEER AND CONSTRUCTION RECORD. The remainder of the volume is occupied with educational circulars and papers, including "Hints on building school houses," "Practical facts about cholera," "Typhoid fever: its prevention and restriction," etc., and a good paper on "Vaccination," by Dr. Horr, a member of the board.

The volume is well printed, on good paper, and is very creditable to all concerned.

THE supplement to the seventh annual report of the State Board of Health, etc., of Massachusetts contains the report and papers on public health for the year 1885 and the first five months of 1886 up to the date of the re-establishment of a separate State Board of Health, June 1, 1886.

The first paper is on an outbreak of malarial fever in Framingham in the summer and fall of 1885. There is a large amount of standing water, of wet and swampy ground, and of decaying vegetable matter of various kinds in the vicinity, but these same conditions have been present for the last nine years without producing intermittent fever. Dr. Z. B. Adams, the author of the report, considers that the circumstances indicate that the outbreak was due to the introduction and rapid propagation of a specific malarial germ.

The report by Dr. S. W. Abbott, the Health Officer of the Board, upon work done in the inspection of food and drugs, taken in connection with the reports of Professor E. S. Wood, the analyst of food, of B. F. Davenport, the analyst of drugs, and of Dr. Harrington and Professor Goessmann, the analysts of milk, show that good work is being done in enforcing the law against adulterations, and that the results are fairly satisfactory. The reports of the analysts contain a large amount of data that will be useful to chemists engaged in similar work.

The report by Mr. W. Wheeler, C. E., on the disposal of sewage at the Massachusetts Reformatory, relates to an interesting piece of work, and full extracts from it will be given in the THE SANITARY ENGINEER AND CONSTRUCTION RECORD.

The last paper in the volume is the summary of the third triennial reports of the various water boards and companies in the State, 88 in number. Details are given for each, and the whole forms a valuable and interesting historical document. Some idea of the importance of the subject may be gained from the statement that the cost of the water-works in operation in Massachusetts is \$49,640,179.26, the daily amount of water furnished is 76,743,773 gallons, and the population supplied is 1,370,627.

Forty-six derive their supply from lakes or large ponds, 22 from brooks, springs, or small streams, 20 from wells or filtering galleries, and 3 from tubular wells.

JOURNALISTIC COURTESY.

THE following courteous invitation from the proprietor of the *Building Budget*, of Chicago, who is also the proprietor of the Permanent Building Exhibit and Exchange, north-east corner of Wabash Avenue and Washington Street, has been received:

"CHICAGO, November 8, 1886.

"SIR: The management of the Permanent Exhibit of Building Materials (which will be the headquarters of delegates of the coming convention of the Western Association of Architects on the 17th of November), invites all first-class technical journals to be represented upon the floor on that occasion. Table-space will be provided for showing sample copies, and every facility given yourself or representative should you visit us. You can have your mail sent to our address, and use the Exhibit as your office."

NEW JERSEY STATE SANITARY ASSOCIATION.

THE annual meeting will be held at Trenton November 19 and 20, in the State-House.

THE Finance Committee of Philadelphia Councils has reported in favor of a lease of the gas-works to the Dolan syndicate.

For Contracting Intelligence, see Supplement.

THE DEFECTIVE WATER-MAINS AT WATERBURY, CONN.

THE water-main that burst recently at Waterbury, to which allusion is made in another column, we learn, on inquiry, is one of the cement-lined sheet-iron pipes that were laid some years since. Our informant states that there have been as many as three or four breaks within as many months. An effort has been made to get appropriations to replace these with cast-iron pipes, but so far without success. The present, trouble, however, may hasten that result.

PERSONAL.

JOHN CHIPMAN HOADLEY, well known as a mechanical engineer and expert, died recently in Boston at the age of 67 years. While a young man, Mr. Hoadley was employed as a draughtsman in connection with the enlargement of the Erie Canal, then went to Lancaster, now Clinton, with Horatio and Erastus Bigelow, to develop the manufacturing industries there, and in 1848 formed a partnership with Gordon McKay for the manufacture of engines in Pittsfield, Mass. Mr. Hoadley was afterward interested in the manufacture of small portable engines, and had much to do with the general introduction of small steam-powers through the country. During the late civil war he was sent as commissioner for Massachusetts to England to inspect ordnance for harbor defence.

For the last ten years he was concerned with special interests, as expert in the courts, and investigator of special features of civil and mechanical engineering, such as the action of driven wells and warm-blast apparatus for steam-boilers, which papers have been given to our readers.

Mr. Hoadley was one of the original trustees of the Massachusetts Institute of Technology, was a member of the State Board of Health for seven years, and a zealous and active member of the American Society of Mechanical Engineers.

MR. ROSWELL P. FLOWER has resigned from the New York Electric Subway Commission, of which he was president, and Governor Hill has appointed Daniel L. Gibbons, the counsel of the commission, to succeed him.

JESSE H. LORD, long a writer for the *Scientific American*, shot himself on the grave of his wife, in Hartford, November 10, in despondency caused by ill health.

SETH WILLMARTH, a famous machinist and inventor, long connected with the Charlestown, Mass., navy yard, died at Malden, Mass., last week in the 69th year of his age.

MR. JOHN E. POWELL has been appointed Electrician of the Treasury Department.

MR. W. B. SWAN has been appointed an assistant engineer on the New Croton Aqueduct.

NEW CATALOGUES.

THE Yale and Towne Manufacturing Company, of Stamford, Conn., have just issued a pocket-album of crane designs, manufactured by that company in which ninety pages of illustrations of different descriptions of cranes and overhead tramway systems for use in machine shops and large works appear.

POLYTECHNIC ASSOCIATION OF THE AMERICAN INSTITUTE.—The officers of the Polytechnic Section of the American Institute have recently announced the prospective reorganization of the section on the same general plan as the Franklin Institute of Philadelphia. It is proposed to hold semi-monthly meetings, with reading of papers and discussions, exhibition of inventions, etc., and to improve the technical library and collection of models. Full information may be obtained of Mr. D. R. Gordon, Secretary, at the hall of the American Institute in New York City.

PASSAIC RIVER.—A report has been prepared by Professor Austin, chemist of the Board to prevent Pollution of the Passaic, to be presented at the next meeting in Jersey City, on measures to be taken against manufacturers and others who continue to pollute the river and the water-supplies of Jersey City and Newark.

MILWAUKEE.—City Attorney Elliott has sent in an opinion that the Mayor must sign the city order for payment of the Asphalt

Block Manufacturing Company, of Chicago, for an asphalt pavement in Court House Square. The Mayor vetoed the resolution of Council ordering payment and Council passed it over the veto. The Attorney holds that as Common Council passed the order over the Mayor's veto the Mayor must sign.

DR. ELLIS has presented a report to the Toronto Water-Works Committee on the examination of Lake Ontario and other lakes from which water is or might be drawn, and pronounces the Ontario water very good.

A QUESTION has arisen between the authorities of the United States and the Pontoon Bridge Co., of Dubuque, affecting the construction of the bridge over the Mississippi. The Pontoon Bridge Company had plans prepared for a pontoon bridge, which were passed upon and authorized by the Government. Before beginning work, however, the company changed the plans and began the erection of a high bridge. Now, although this bridge is considered by the Government Engineer, Major Mackenzie, preferable to that first proposed, the difficulty comes from the fact that the Pontoon Company is going ahead building a bridge over the Mississippi without any authority for that particular bridge from the United States.

Building Intelligence.

We solicit from each and every one of our readers information relating to projected buildings in their locality, and should be glad to receive newspaper clippings and other items of interest.

ABBREVIATIONS.—*b* 2, brown stone; *br*, brick; *br st*, brick store; *bs dwll*, brown-stone dwelling; *apart house*, apartment-house; *ten*, tenement; *e*, each; *a*, owner; *ar*, architect; *b*, builder; *fr*, frame.

NEW YORK CITY.

Pier 21, East River, foot of Burling slip, 1-story iron and fr freight-shed; cost, \$6,000; lessees, C. H. Mallory & Co.; a, Thomas Rowland.

Stanton, n w cor Orchard st, 5-story and bmt br ten; cost, \$18,000; o, Frederick B. Harnisch, on premises; a, Frederick Ebeling.

89th st, s s, 25 e 3d av, 3 1-story br stores and dwells; cost, each, \$3,000; o, William Rhinelander; att'y, G. W. Bashford, 79 Cedar st; a, W. W. Gardiner.

117th st, s s, at East River, abt 565 e Pleasant av, 2-story br factory; cost, \$5,000; lessees, Vandervoort & Tucker, 341 E 120th st; a, Charles E. Miller.

89th st, n s, 82.2 w Park av, 5-story br chapel, Sunday school, and residence for pastor; cost, \$20,000; o, Prospect Hill Reform Church, O. H. Walser, pastor, Lexington av, s w cor 81st st; a, S. B. Reef; b, Charles H. Bunn.

96th st, n s, 100 w 3d av, 3 5-story br tens; cost, each, \$15,000; o, Ella A. Treacy, 76 W 111th st; a, J. H. Valentine.

98th st, n s, 80 e 10th av, 3-story and bmt br dwell; cost, \$12,000; o and b, Sarah E. Hinman, 342 W 131st st; a, J. H. Valentine.

Sedgwick av, n w cor 184th st, 2-story and attic fr dwell; cost, \$6,000; o, Melvina P. Anger, 119 W 123d st or 23d st; a and b, Chas. E. Jacques.

(Continued on Supplement.)

Proposals.

(Continued from page 562.)

LAUNDRY APPARATUS, BALTIMORE, MD. —Treasury Department, Office Supervising Architect, Washington, D. C., November 10, 1886. Sealed proposals will be received at this office until 2 p. m. on the 23d day of November, 1886, for supplying and putting in place, complete, the Laundry Apparatus required for the Marine Hospital Buildings at Baltimore, Md., in accordance with drawing and specification, copies of which and any additional information may be had on application at this office or the office of the Custodian. Bids must be accompanied by a certified check for \$200. M. E. BELL, Supervising Architect.

HOT SPRINGS RESERVATION IMPROVEMENTS, Hot Springs, Ark. Until November 16. Address L. O. C. Lamar, Secretary of the Interior, Washington, D. C.

REMOVING Rock in Portsmouth Harbor, N. H. Until November 17. Address Major Jared A. Smith, U. S. Engineers.

IMPROVING Central Avenue, Cincinnati, including all work connected with asphalt roadway, curbing, etc. Until November 25. Address the Board of Public Affairs, D. W. Browne, Clerk.

REFRIGERATING MACHINERY in connection with Hamilton County, O., Morgue. Until November 20. Address Board of County Commissioners of Hamilton County, Cincinnati, O. Architects Forbush & Green, Allen Building, Cincinnati.

ASPHALT ROADWAY, etc., on Ann Street, Cincinnati, O. Until November 25. Address the Board of Public Affairs, D. W. Brown, Clerk.

Proposals.

FURNISHING 300 fathoms of mud chain for Light-House Depot at Tompkinsville, N. Y. Until November 15. Address Commodore A. E. K. Benham, U. S. N., Inspector of 3d Light-House District.

CONSTRUCTING water-supply work. Until December 15. Address Philip C. Schuyler, Clerk of Water Committee, Portland, Me.

FURNISHING and delivering brush for improvement of New Orleans Harbor. Until November 15. Address Major Charles W. Raymond, U. S. Engineers, 3 S. Rampart Street, New Orleans, La.

DREDGING in Tchefunete River Louisiana. Until November 27. Address Major W. H. Heuer, U. S. Engineers, 63 Carondelet Street, New Orleans. Dredging material from bars and building pile and plank revetment at Calcasieu Pass, Until November 16. Address Major W. H. Heuer, U. S. Engineers, 63 Carondelet Street, New Orleans.

New Advertisements.

A. ALLER, New York. Lyman Condensing-Head, P. 559.

PROPOSALS. P. 562-573.

EMPLOYMENT WANTED. P. 562.

BABCOCK & WILCOX CO., New York and Glasgow. Steam Boilers. P. 573.

KELLY & JONES CO., New York. Steam-Heating Specialties. P. 574.

NATIONAL ELECTRIC-SERVICE CO. P. 576.

MYERS SANITARY DEPOT, New York. Superior Plumbing Goods. P. 577.

THE MEYER-SNIFFEN CO., New York, Boston, and Chicago. Sanitary Specialties. P. 578.

THE J. L. MOTT IRON-WORKS, New York and Chicago. Sanitary Specialties. P. 579.

SAMUEL R. BULLOCK & CO., New York. Engineers and Contractors. P. 580.

ANNOUNCEMENT.

WE desire to call attention of consumers to the fact that we guarantee our ready-mixed paints to be made only of pure linseed-oil and the most permanent pigments. They are not "Chemical," "Rubber," "Patent," or "Fire-proof." We use no secret or patent method in manufacturing them by which benzine and water are made to serve the purpose of pure linseed-oil. Sample cards containing 50 desirable shades sent on application.

F. W. DEVOE & CO.,
FULTON ST., COR. WILLIAM, Established 1852,
NEW YORK. ARTISTS' MATERIALS
FINE VARNISHES.

LIEBIG COMPANY'S EXTRACT OF MEAT. Finest and cheapest Meat Flavoring Stock for Soups, Made Dishes, and Sauces. Annual sale 8,000,000 bars.

LIEBIG COMPANY'S EXTRACT OF MEAT. An invaluable tonic. "Is a success and a boon for which nations should feel grateful."—See "Medical Press," "Lancet," etc. Genuine only with the fac-simile of Baron Liebig's Signature in Blue Ink across the Label. The title "Baron Liebig" and photograph having been largely used by dealers with no connection with Baron Liebig, the public are informed that the Liebig Company alone can offer the article with Baron Liebig's guarantee of genuineness.

LIEBIG COMPANY'S EXTRACT OF MEAT. To be had of all storekeepers, Grocers, and Chemists. Sole Agents for the United States (wholesale only) C. David & Co., 9 Fenchurch Avenue, London, England. Sold wholesale by James P. Smith, Park & Tilford, Acker, Merrill & Condit, McKesson & Robbins, Thuber, Whyland & Co., Francis H. Leggett & Co. Chas. N. Crittenton, and W. H. Schieffelin & Co.

THE DAVIS STANDARD AUTOMATIC AIR-VALVE is used by all leading steam-fitters in the United States and Europe, for direct and indirect radiators. All first-class jobbers keep them. HAY & PRENTICE CO., Manufacturers, CHICAGO.

ANGLO-INDIAN Art Carpets.

The new Anglo-Indian Art Carpet, made in one piece without any seam or join whatever, with fringed border complete, in all the new colors and in a variety of sizes. No making required, and the price is almost the same as an ordinary yard-wide carpet.

Manufactured expressly for
W. & F. SLOANE,
BROADWAY, 18TH & 19TH STS.,
NEW YORK.

A Safe Boiler.

A Boiler Insurance Company has published the following and sent it far and near with the apparent intention of causing the public to believe that a BABCOCK & WILCOX BOILER has exploded:

A LOSS PAID ON A BABCOCK & WILCOX BOILER, WHICH IS CLAIMED TO BE NON-EXPLOSIVE AND ABSOLUTELY SAFE.

OFFICE OF BROOKLYN SUGAR REFINING COMPANY, BROOKLYN, N. Y., October 20, 1886.

American Steam-Boiler Insurance Company. GENTS: We desire to express to you our gratification and our thanks for the prompt manner in which the recent loss was adjusted upon one of our Babcock & Wilcox boilers, having received within two hours after rendering proof of loss to you the full amount of our demand for the damage to our boiler, and also the payment of the claim of Patrick Stapleton, one of our workmen, who was scalded by the escaping steam.

Yours truly,
BROOKLYN SUGAR REFINING COMPANY,
J. A. STURSBURG, Secretary.

It seems to be a settled policy of all Boiler Insurance Companies to discourage the use of Safety Boilers, as the fear of explosion is the greatest inducement to take out policies. But the apparent reason of publishing and sending the above notice with the following words in large type: "A Loss paid on a Babcock & Wilcox Boiler, which is claimed to be non-explosive and absolutely safe," is evidently grudge or spite, accounted for mainly from the fact that at one time they endeavored to have the BABCOCK & WILCOX CO. treat with them for a general line of insurance on all of their manufactures, which was declined by this Company on the ground that they had no confidence either in the stability of the company or the honesty of its management. The departure of the treasurer of said Insurance Company soon thereafter for Canada, where he has since, as far as known, remained, shows that the opinion of the BABCOCK & WILCOX CO. was not without foundation.

The following letter shows the actual facts in the case referred to:

OFFICE OF BROOKLYN SUGAR REFINING CO., BROOKLYN, N. Y., Oct. 20, 1886.

Messrs. The Babcock & Wilcox Co., New York: GENTLEMEN: In reply to yours of 20th inst., would say that we sincerely regret that our letter of 20th inst. to the American Steam-Boiler Insurance Company should in any way reflect upon the quality of your boilers, as we certainly did not intend to convey any such impression. Our high opinion of your boilers we believe to have demonstrated thoroughly by the repeated orders that we have given you since 1876.

The unfortunate accident referred to was caused by the negligence of our man in charge of the boilers, who was consequently, after proper investigation, promptly discharged for allowing the water to get low. This caused several tubes to be badly burned and ruptured, which was the only damage done to property.

The injury done to Patrick Stapleton by the escaping steam was fortunately so slight that he was enabled to return to work on the second day following the accident.

We shudder to contemplate what the result would have been had we had in use any other style of boiler.

Yours truly,
BROOKLYN SUGAR REFINING CO.,
JOHN A. STURSBURG, Secretary.

Twenty years' use and upwards of 300,000 horsepower sold, without a single explosion, demonstrate that these boilers are all that is claimed for them.

For a SAFE, ECONOMICAL, and DURABLE BOILER which REQUIRES NO INSURANCE AGAINST EXPLOSION, purchase of

THE
BABCOCK & WILCOX Co.

30 Cortlandt St., New York.
107 Hope St., Glasgow.

New York, Nov. 1, 1886.


THE OSBORNE SYSTEM OF STEAM-HEATING is based upon scientific principles carefully worked out and reduced to practice, having been in use for the last seven years; in short, it is an ideal system of steam-heating, adapted for use in all large buildings requiring steam heat. It is from 15 to 20 per cent. more efficient than the Gravity System, and from 30 to 40 per cent. more efficient than any of the Expansion or High-Pressure Systems using traps and open tanks.

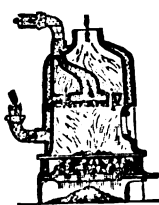
For further information apply to

E. F. OSBORNE, M. E.,
ST. PAUL, MINN.


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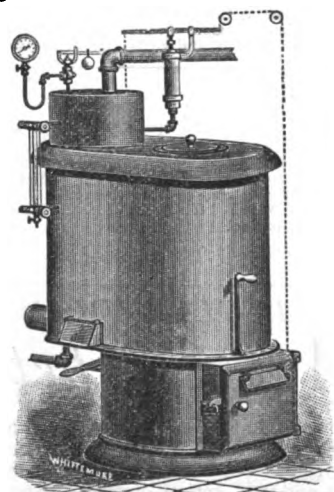
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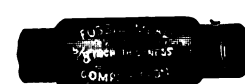
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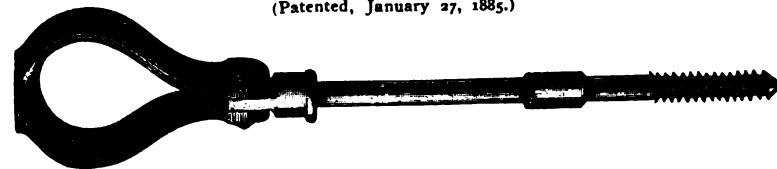
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A JOURNAL FOR THE ARCHITECT, ENGINEER, MECHANIC, AND MUNICIPAL OFFICER.

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BUILDERS' AND CONTRACTORS' ENGINEERING AND PLANT.

It is proposed to begin in our next issue a series of articles with the above title. They will be prepared under the direction of Mr. Francis Collingwood, Mem. A. S. C. E., M. Inst. C. E. They will describe the leading types of apparatus, appliances, and methods likely to be of interest to every person engaged in engineering operations, the erection of structures, and the transport of materials, and it is proposed to make a special feature of illustrated descriptions of methods and plant employed in important engineering works and on notable buildings, preference being given to work in which novel problems are presented and exceptional measures adopted. It is not possible that everything described will be new to all of our readers, but we shall endeavor to be accurate, and we hope that the treatment of this practical side of Engineering and Architecture will be such that the information will be presented in an accessible form, and prove of value to the members of both professions and those who undertake to carry out their designs.

THE New York Times of November 12 contains a communication from Mr. James Gallatin, in which he proposes a plan for reducing the expenses of the New York City Board of Health without lessening its efficiency, the reduction proposed being mainly in the salary list.

While admitting that the president of the board, General Shaler, has originated certain objectionable and extravagant methods of administration, Mr. Gallatin points out that the other three members of the board could at any time have prevented such measures, and that they must therefore take their share of the responsibility for them.

While we do not pronounce any opinion as to the merits of the detailed criticisms upon the methods of the board made by Mr. Gallatin, it must be admitted that they are not mere vague complaints and denunciations, but specific and definite, and that he also proposes a specific and definite remedy. It must also be admitted that the present condition of our Health Board is very unsatisfactory. It does not possess that confidence of our citizens that it hitherto enjoyed, nor is it possible that it should do so under its present head. It certainly seems as if some unnecessary offices had been created under it, some salaries paid which are in excess of the work done by those who receive them, and some appointments made under the influence of political bargaining and favoritism rather than because of the possession of proper qualifications by the men appointed. There is no remedy but change of the president of the board and of some of the subordinates. Nothing else will restore confidence and enable the board to obtain the funds needed for the important work which it has to do.

Since Governor Hill seems unwilling to allow Mayor Grace to appoint a successor to General Shaler, it is to be hoped that he may act in the premises after Mr. Hewitt assumes the duties of Mayor.

THE effect of sewerage on the mortality from typhoid fever is shown in some statistics given by Dr. Adelt in a carefully prepared article on the sanitary conditions of the city of Bunzlau,

which is published in Vol. XLV. of the *Vierteljahrsschrift für gerichtliche Medizin und Öffentliches Sanitätswesen* for the current year. Bunzlau contains about 10,500 inhabitants. The old part of the city has a combined system of sewerage for that part which is most densely populated, and in this part the average annual mortality from typhus and typhoid during the twenty years (1863-1883) was 0.048 per 1000. A part of the old city and a large part of the new have sewers for rain-water, street-washings, and house-drainage, exclusive of excreta, which last are disposed of in privy-vaults, and in this section the average annual mortality for the same period from typhus and typhoid was 0.292 per 1,000. In that part of the city without sewers the corresponding rate was 0.352, and in the vicinity of the sewage irrigation fields it has been 0.363.

MR. GEORGE LIVESEY, Chairman of the South Metropolitan Gas Company, writes to the *Times* in favor of the proposed abolition of the coal and wine dues of London. It appears that the gas companies pay £100,000 of the coal duty, and another writer in the *Times* objects to the abolition on the ground that the gas companies would profit by the amount. Mr. Livesey, however, calls his attention to the sliding scale, of which he says "for every £5 the gas companies may save or gain they are entitled to £1, after they have given £4 to the consumers." The London gas companies are paying the full dividends to which they are entitled, and they could not, therefore, profit by the proposed change until the price of gas was reduced. He says it is "a matter of certainty that the non-renewal of the coal duties would result in a reduction in the price of gas of about 1s. per 1,000 feet, which on the 22,287,492,000 feet sold last year amounts to £92,864, or say £100,000 a year benefit to the consumers of gas in 1890, the first year after the duties cease."

A BY-LAW was submitted to the taxpayers of Toronto in the early part of last month to authorize the construction of a trunk-sewer on the recommendation contained in a report by Mr. W. J. McAlpine, of New York, and Messrs. Tully and Sproatt, City Engineers, of Toronto. The by-law was rejected. A mixed committee of aldermen and leading citizens has been formed to collect all the evidence possible and discuss all points which may arise. We have little faith in such committees; there are always men on them full of crotchets, whose opinions are listened to, and carry weight from some social or public position of the promoter. This is evident in the proposals already vented to discharge all the sewers, some eight in number, into the harbor, at a point about 150 yards from the shore, and trust to the current in the harbor to carry away the sewage. The harbor is practically land locked. A gap 200 yards wide exists at the east end; the opening at the west end is about the same width. These openings are over two miles apart. It has not yet been established that there is a diurnal current in the harbor. We recommend Toronto to discharge the committee, place the work under some experienced sanitary engineer, and employ trained engineers to act under him in making observations and gathering facts, the need of which the professional mind can appreciate. We would also

suggest to the Council that observations extending over a lengthened period, as the citizens of Chicago are now doing, be carried on. This work should embrace the period of fall and spring storms, to throw light on the much-debated question of westerly currents from Scarborough Heights, six miles to the east of the city, especially in relation to their action on the intake crib of the water-works. Then let the Council lay before the taxpayers all the information, in a simple and intelligible form; this will satisfy the public mind and insure the success of a scheme on which the future welfare of the city depends.

STANDARD THREADS OF WROUGHT-IRON PIPES.

WE print elsewhere a notice of the adoption of the Briggs standard for pipe-threads by the wrought-iron pipe manufacturers of the United States. This will be appreciated by the users of wrought-iron pipe, be they plumbers,

OUR BRITISH CORRESPONDENCE.

"Exhibitors' Representatives"—Cholera on the "Euphrates" and Lack of Preparation at Portsmouth—Foul Condition of the Air in the Underground Tunnels—New Method of Making Cement.

LONDON, October 30, 1886.

I HAVE already on a previous occasion warned intending exhibitors at the American Exhibition against the circulars of so-called "Exhibitors' Representative," who undertakes the care of stalls for absent exhibitors for a nominal charge, and whose representation consists in placing a card on the stand giving a reference to some other part of the building where he may possibly be found. In view of incidents which have occurred at the Liverpool Exhibition, I think it well to repeat the warning, and impress the fact that unless an exhibitor who goes to the expense of an exhibit is prepared to go to the further expense of a proper and qualified attendant, he had better save the initial expense, and not send his goods. Employing these "Rep-

the jurors, and offering to obtain the award merited on somewhat similar terms. These proposals emanating from a man claiming to be officially appointed have, of course, thrown a doubt upon *bona fides* of the awards generally, and disgusted independent firms. I think I have said enough to warn intending exhibitors, and if any such who are readers of THE SANITARY ENGINEER AND CONSTRUCTION RECORD fall into the hands of the "Exhibitors' Representative" they will have only themselves to thank in case of disagreeable *contre-temps* or disappointment.

The news of four cases of cholera on board the "Euphrates" troop-ship, now on her way to Portsmouth from India, draws attention to the singularly unprepared state of the former port for the reception of such a vessel should she, on arrival, still have cholera on board. It is true there are two quarantine hulks on what is known as the "Mother Bank," just outside the harbor, but these hulks have been allowed to get into disrepair, and are neither fitted up nor furnished, and are most ill adapted for such a purpose as quarantine ships. The Admiralty



RESIDENCE AT SHORT HILLS, N. J.—LAMB & RICH, ARCHITECTS.

steam-fitters, gas-fitters, or any of the kindred trades. Indeed, it is a matter of more importance than an individual unacquainted with the subject is able to appreciate. We hope now a uniform length of fittings with as long radii as possible may soon be adopted, thus making it possible for a fitter to order his pipe cut to lengths from one house and his fittings of another, and yet have the whole "make up" accurately when received.

THE Ladies' Health Protective Association, of Beekman Hill, in this city, which waged a determined warfare on Michael Kane's manure-dumps on the East River, has now undertaken another good among the tenement-houses. These energetic ladies have begun an inspection of the tenement-houses in their part of the city, and say they are going to push every means to compel landlords to light the halls and furnish water on the upper floors. They are preparing a report on tenements.

representatives" (so-called on the *lucus a non lucendo* principal probably) is, to use an old English saying, "spoiling the ship for a ha'porth of tar." In the case of the Liverpool Exhibition, the procedure of the most enterprising of these gentry has been the cause of several good firms who have given personal representation declining to accept the medals awarded them, on the ground that they are perfectly valueless either from an honorary or commercial point of view. This refusal to accept awards has reflected upon those firms for whom awards were obtained by exhibitors' representatives. The origin of these refusals is, that a certain enterprising individual wrote round to a large number of exhibitors offering to represent them before the juries, when his special influence would enable him to obtain "the award the exhibit merited." The stated fee was to be £20 (\$96) for a gold medal, and £10 for a silver, no fee being charged if no award was obtained. After the jurors' awards had been made public, he wrote round to unsuccessful exhibitors, whom he probably had not represented, stating that he was sure the merits of their goods had not been properly put before

authorities are busy devising some scheme to get over the difficulty, but probably when the ship does arrive she will have to be detained at Spithead—a most undesirable course, but the only one open from want of unsuitable precautions having been taken.

The condition of the tunnels in the underground railways is again creating discussion, owing to the foul atmosphere. I am surprised to note that a journal possessing the authority of the *Lancet* is urging that trial should be made of Dr. Neale's "Chemical Lung" for decarbonizing and purifying the air.

A new method of making cement is on trial at the Gypserie de la Gare, in France. The special point about the new process is that the stone is crushed before being fired instead of after, the object being to equalize the burning. The stone is reduced to a powder through the medium of a crushing-mill and a vertical cylinder mill, whence it is delivered on to sieves over pans heated by gas and having gyratory motion.

SAFETY-VALVE.



THE SANITARY ENGINEER & CONSTRUCTION RECORD ILLUSTRATED SERIES

GYMNASIUM AT LEHIGH UNIVERSITY, BETHLEHEM, PA.

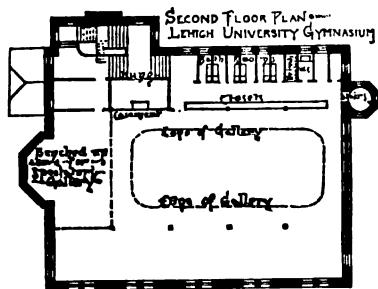
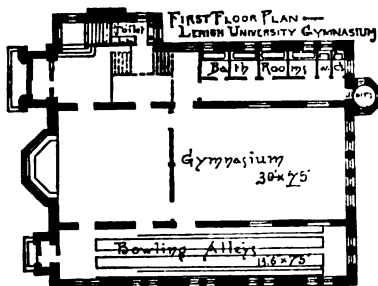
ADDISON HUTTON, ARCHITECT.



OUR SPECIAL ILLUSTRATION.

LEHIGH UNIVERSITY GYMNASIUM—ADDISON HUTTON,
ARCHITECT, PHILADELPHIA.

OUR special illustration this week shows the Lehigh University Gymnasium, situated at Bethlehem, Pa. The building is three stories high, of Potsdam sandstone, and cost \$40,000. The main hall, on the third floor, is 75x45 feet, and is furnished with all kinds of gymnastical appliances. Bowling-alleys and a billiard-room are also in the building. There are on the first floor a billiard-room, 30x30 feet, containing a pool-table and a billiard-table; an assembly-room, 44x30 feet, for students' meetings, which, although furnished with settees, can be also used for fencing and sparring, and a bathing and dressing room, 38x13½ feet, containing 4 long tubs, 2 water-closets, and 126 ventilated closets, or lockers, for clothing. A small side room, containing 2 wash-bowls and 3 urinals, opens from the vestibule on the left. On the second floor, which is reached by a broad main stairway in front and a retired stairway in the tower at the rear, there are four rooms—viz., the director's office, 16x7 feet, fitted with electric-bells, and so arranged with glazed casements as to command a view of the whole floor as well as the stairway from the vestibule; the examining-room, 10x7 feet, fitted with scales, measuring-rods, dynamometers, and the appliances for making the



various strength-tests and recording the results of the examinations; a bath-room, 44x13½ feet, containing 6 soap-stone sponge-bath tubes, 3 urinals, a water-closet, shower-room with communicating drying-closet, and 120 lockers, and the main hall or exercise-room, 75x45 feet. The main hall is 40 feet high in the centre, and lighted by a bay-window containing 12 large panes, 36 large windows, 52 smaller windows, besides 8 large skylights of ground-glass in the roof, each containing 5 panes, 2x7 feet. The visitors' gallery, having benches for spectators, and the running-track of 38 laps to the mile, take the place of a third story. The main hall is fitted with 23 pairs of chest-weights, 22 pieces of Dr. Sargent's apparatus for individual development, and the usual gymnastic apparatus, such as parallel and horizontal bars, flying and traveling rings, trapezes, ladders, spring-board, Indian clubs, dumb-bells, etc. The ceiling of the main hall and of the dressing-room is of oiled yellow pine.

The architect was Mr. Addison Hutton, of Philadelphia, who was assisted by Dr. Sargent, of the Hemenway Gymnasium of Harvard College.

For information in compiling the above we are indebted to the Circular of Information of the Bureau of Education, No. 5, 1885, which obtained the plans and description from President R. A. Lamberton and Director W. H. Herrick.

OUR ILLUSTRATION OF A MODERATE-COST HOUSE.

RESIDENCE AT SHORT HILLS, N. J.—LAMB & RICH,
ARCHITECTS.

THE subject of our vignette illustration is the residence of Mr. Stewart Hartshorn, at Short Hills, N. J. The material used is stone and wood. The first story is rubble-work, above the first story is frame. The floors are ash and the finish is pine, stained. The architects are Lamb & Rich, of New York City.

COTTAGE (SMALL) HOSPITAL CONSTRUCTION.

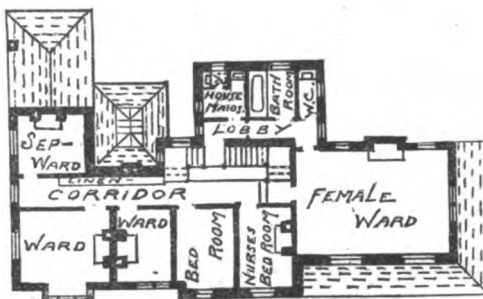
BY HENRY C. BURDETT.
Author of Cottage Hospitals, Pay Hospitals of the World, etc.
No. X.*

COTTAGE HOSPITAL, ST. PAUL'S CRAY, KENT.

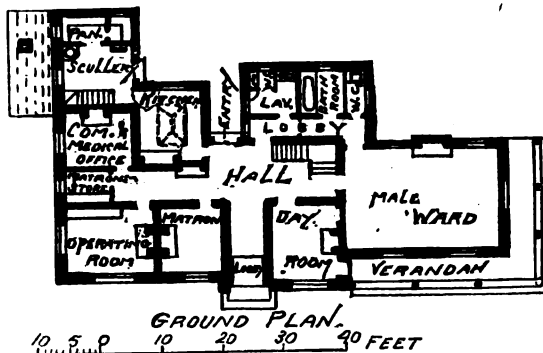
THIS hospital has been built by subscription for the benefit of Chislehurst, Sidcup, Orpington, the Crays, and adjacent parishes. It occupies a site an acre and a quarter in extent on the road between St. Mary Cray and Bexley, well elevated and with a dry soil.

The building, which faces west, is of two stories, and is of a simple and appropriate character.

The ground floor contains a male ward for five patients, day-room, matron's room, operating-room, store-room, committee and medical officers' room, and kitchen offices. Two earth-closets, lavatory, and bath-room are approached through a lobby with cross-ventilation. The upper floor has a female ward for five beds, two smaller wards for special cases, a separation ward for a doubtful case, nurses' bedrooms, and the same provision of closets, etc., as below.



FIRST FLOOR PLAN



On looking at this plan one is struck by the utter want of method evinced. The parts all seem to be thrown together without order or arrangement, and the result is far from satisfactory. The female ward should have been placed on the ground floor in a corresponding position to the male ward, while between them the matron's room, day-room, committee-room, and operating-room should have been placed. The kitchen offices ought to have been put out at the back, with an intervening lobby to shut out the smell of cooking. The veranda, which runs round two sides of the male ward, must be very detrimental to ventilation, and could have been arranged in connection with the day-room. The earth-closets and ward-sinks should be placed in small projecting wings to the wards, and the lobbies of communication constricted to the smallest available width. The short wide lobby shown on the plan is practically of very little service for disconnection.

The special wards for serious cases should have been placed on the ground floor, and the separation ward on the upper floor, with, if possible, a disconnecting lobby of approach. The contract for the erection of this hospital was £2,162.

* No. IX., the Sanatorium at Reedham, was illustrated in our issue of September 30, 1886.

PAVEMENTS AND STREET RAILROADS.

No. III.

(Continued from page 393.)

PAVEMENTS IN LIVERPOOL.

THE introduction of impervious pavement in Liverpool began in 1872, the Health Committee in that year approving of the recommendation of their then engineer (G. F. Deacon, M. Inst. C. E.) relative to the laying in the city generally of this class of pavement. From that date the work has been prosecuted without intermission. Up to the end of 1879, there were laid 371,500 yards, and since then up to 1886, 1,000,000 yards have been laid. We have in a previous article described the method of laying tramways through paved streets. From the nearly fifty miles of these now laid the city derives a rental of \$150,000 per annum, and the annual cost of maintenance is found to be but about \$7,500, leaving a handsome balance toward a sinking fund for repayment of cost.

Through the courtesy of Mr. Clement Dunscombe, M. Inst. C. E., present City Engineer, we have obtained the following information respecting the pavements now being laid down:

The streets of Liverpool are divided into first, second, and third class.

First-class streets, or main lines of communication, are paved as follows: First, a Portland cement concrete foundation is laid six inches deep. The concrete consists of one part by measure of cement, five to six parts gravel, and seven to eight of broken stone; the gravel and cement being thoroughly mixed dry, and only enough water then allowed to flow on it to make the material damp enough after it is incorporated to retain its form when a portion is taken in the hand and pressed.

The ground having been excavated, thoroughly consolidated, and properly graded to the requisite depth and shape, a layer of broken stone (or other material) is spread evenly over the surface and thoroughly wet from the rose of a watering-can. A stratum of mortar, mixed as described above, is spread over this and a second layer of stone added. The stone is then "beaten in with a heavy flat beater." Other layers of mortar and stone are added and thoroughly beaten in, until the required thickness is obtained, the final layer of cement mortar being smoothed off to an even and uniform surface.

It is required that the broken stone shall all be capable of passing in any direction through a 2½-inch ring and be clean and free from foreign matter. The so-called "gravel" must be "free from all stones that will not pass through an inch sieve," and clean and free from foreign matter. No inferior limit is given. The cement must not leave more than ten per cent. residuum on a No. 50 wire sieve, and pure cement setting in water must after seven days give a tensile strength of 400 pounds per square inch.

The concrete must set ten days before paving is begun upon it.

On the foundation thus prepared is spread a layer of "fine gravel" not exceeding a half an inch in thickness, on which the granite or syenite sets are laid in "regular, straight, and properly bonded courses, with close joints. The sets are 6¼ inches deep, 3¼ inches wide, and 5 to 7 inches long. In streets with heavy traffic the depth is 7¼ inches. The joints of the sets are then filled with hard, clean, dry shingle; the sets then thoroughly rammed and additional shingle added until the joints are full. The joints are then carefully filled with a hot mixture composed of coal-pitch and creosote oil, and the whole pavement covered with "half an inch of sharp gravel."

The channel-stones (or gutter-stones, as we call them) are of granite or syenite, and are 3 inches thick, 16 inches wide, and not less than 3 feet long, with parallel beds and faces, and square sides and ends. They are laid in cement concrete, and have joints filled as before described.

The curb-stones are 6 inches thick at top, 7 inches thick at 5 inches below the top, and not less than that below, nor less than 3 feet long or twelve inches deep, whether straight or curved. To be smoothly dressed on top, 8 inches down the face and 3 inches down the back; the remainder of the stone to be hammer dressed, and the joints square for the entire depth.

The footways are laid with 3-inch flags of best quality; no flags to be less than 2 feet wide or 3 feet long. Joints to be squared for the whole thickness. Stones laid on a bed of "fine gravel," and joints flushed with cement mortar.

In all streets the height of crown above the channel is proportioned to the width of the street, the rate of inclina-

tion in the cross-section being 1 to 36. The channel-stone is laid level (in a direction crossing the street), and between it and the centre the section curves, so that, calling the centre height 1, the heights at one-fourth, one-half, and three-fourths the distance to it will be respectively 0.35, 0.65, and 0.87 (see cross-sections).

Crossings consist of three rows of 16x8-inch granite crossing-stones, with sides and joints dressed to full depth. All bedded in concrete, and joints filled same as the paving joints. No piece less than 3 feet long. A groove 1 inch long and $\frac{3}{4}$ -inch deep is cut along this middle line of upper surface of each stone.

For second-class streets the foundation is either as has just been described, or it may consist of "6 inches of bituminous concrete, made of clean, angular, broken stone, grouted with a hot mixture of coal-pitch and creosote oil, covered with chippings and thoroughly consolidated by rolling with a roller of sufficient weight."

The paving-blocks are granite or syenite, and the blocks are either 5 inches deep and 3 inches wide or 4-inch cubes, set and finished in the same manner as first-class pavements on $\frac{1}{2}$ -inch of "fine gravel."

For third-class streets a foundation of hand-placed rock 10 inches deep and set on edge is laid. Over this enough gravel is spread to fill the spaces and form a smooth surface, and this is then compacted by a steam-roller. The

cess of any additional price which would have to be paid at the quarry for gauging the sets to one uniform width in the first instance, and my experience has always been that although gauged sets may cost 1s. 6d. per ton more than ungauged sets, there is eventually a considerable saving by specifying that they be accurately gauged prior to leaving the quarry. As regards the width of the joints of the sets, these cannot, in my opinion, be too small. It is a mistaken notion to suppose that the width of the joints makes the pavement in any way safer, as the inequalities of the sets give sufficient foothold. Wide joints are open to very great objection on many grounds, and where these joints are grouted in lime or cement instead of pitch and creosote oil they often become the receptacles for all filth. Payment is made by weight, and not by number, as with us.

The specifications for paving contain an important provision often overlooked—viz., "suitable screens to be provided wherever stones are being chipped or dressed for the purpose of protecting pedestrians."

The whole of the work in Liverpool of paving the streets and the construction of the sewers is executed by corporation workmen skilled in their respective callings, at the lowest possible prices consistent with good work, and the material is of the best quality and selected with the greatest care. The most durable syenite only is used, and the work is such that the maintenance upon it for a series of years,

which never dies the truest economy, and far cheaper in the long run than the system which too often obtains under the plea of economy of perpetually expending small sums in maintenance. The result of this temporizing policy is that the work is never complete or as satisfactory as by the process adopted and already described of executing public works in the best possible manner in the first instance, and thus reducing the annual maintenance charges upon them. By this means the sinking fund necessary to pay off the original debt is provided without in any way increasing the burden of the ratepayers in the shape of increased taxation.

Up to the year 1872 many of the streets of the city were private and mostly paved with boulders, but since that time all such paving has been prohibited, and no private street has been adopted by the city unless paved, flagged, curbed, channeled, and otherwise completed in accordance with the specifications applicable to the street due to its circumstances of traffic.

Within the last few years over a million and a quarter superficial yards of set paving on a concrete foundation have been laid in streets either macadamized or badly paved, the boulders, inferior paving materials, and other stones being utilized for concrete. The present cost of the syenite set pavement is as follows:

First-Class Specification.—3x6 inch sets on a 6-inch cement concrete foundation. The cost per superficial yard, 13s. 6d.

Second-Class Specification.—Four-inch cubes or 3x5-inch sets on a 4 to 5 inch concrete foundation. Price per superficial yard, 9s. 9d.

Third-Class Specification.—Four-inch cubes on a local hand-pitched foundation 10 to 12 inches in depth. Price per superficial yard, 8s. 4d.

The length of adopted streets in Liverpool under maintenance by the corporation is about 249 miles, and the cost of their maintenance per annum in the best possible manner is £7,400, or \$37,000; showing that the superior mode of executing the paving-works in Liverpool has a resulting maintenance charge of the smallest amount. A considerable portion of this small annual charge is due to the cost of maintaining certain macadamized roads, which, on account of convenience, it is considered advisable to maintain as such.

In 1871, when the mileage of streets under maintenance was considerably less, these charges were estimated at £22,000 or \$110,000.

As the wear of the pavement is practically nothing, the scavenging of the streets is reduced to a minimum, the material removed from the streets consisting principally of manure, which has a ready sale. In a city such as Liverpool this is a

matter of the greatest importance, as the collection and removal of road refuse is a most expensive process, inasmuch as the material has to be collected at a considerable cost and barged away in specially constructed steam hopper-barges to sea and there deposited. The reduction of the quantity of unsalable road refuse effects in itself a considerable annual saving, and is an important element in showing that the best-class pavements are the cheapest under the conditions stated.

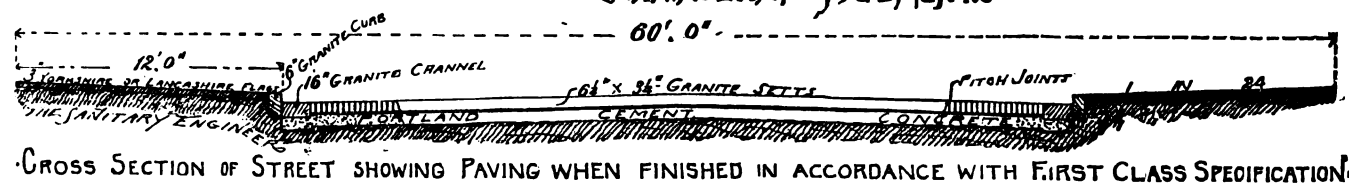
The drawing published herewith shows the various cross-sections of the streets as paved in Liverpool, with the respective materials used. The footways are also sometimes completed with concrete slabs specially laid.

The area of the city is 5,210 acres, and the population is approximately 586,320, or at the rate of 112.5 per acre.

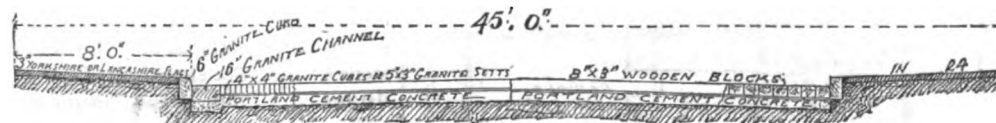
Liverpool being so densely built upon and being the largest seaport, it is especially liable to the importation of disease or the occurrence of epidemics. The perfect sewerage and the internal drainage of the city, together with the impervious nature of the streets and surroundings and the rapid collection of all refuse, has had an important bearing on the health of the community, and it is this, together with the precautions taken by the Medical Officer of Health's Department and other agencies, that has tended to create the satisfactory health condition of the city, the death-rate being at present 23.7 per 1,000.

(TO BE CONTINUED.)

CITY OF LIVERPOOL CARRIAGEWAY PAVEMENTS.

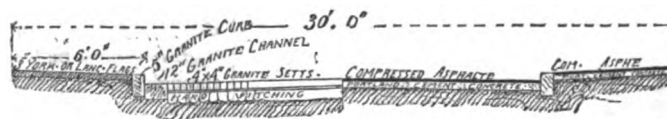


CROSS SECTION OF STREET SHOWING PAVING WHEN FINISHED IN ACCORDANCE WITH FIRST CLASS SPECIFICATION.



HALF CROSS SECTION OF STREET SHOWING PAVING WHEN FINISHED IN ACCORDANCE WITH SECOND CLASS SPECIFICATION.

HALF CROSS SECTION OF STREET WHEN PAVED WITH WOODEN BLOCKS.



HALF CROSS SECTION OF STREET SHOWING PAVING WHEN FINISHED IN ACCORDANCE WITH THIRD CLASS SPECIFICATION.

HALF CROSS SECTION OF STREET WHEN FINISHED WITH NATURAL IMPRESSED ASPHALT ON PORTLAND CEMENT.

Note

Scale - of - Feet

Clement Dunscombe
City Engineer
Liverpool

The height of the Crown of the Street above the Channel is proportional to the width of carriageway & the rate of inclination being 1 in 36. The Channel is laid perfectly level; and the surface between it and the centre of the Street to a curve having ordinates of .35 .65 & .87 at equal distances from the Channel 1 being taken as the total rise.

blocks consist of 4-inch cubes of granite or syenite, set and finished in the same manner as first-class on $\frac{1}{2}$ -inch of "fine gravel."

The specifications for sets require that they shall be equal in quality and toughness to the standard samples, and shall be dressed and gauged with equal accuracy. The maximum deviations allowed are one-quarter inch in depth and breadth respectively. This is readily determined by placing several of them in close contact side by side on a board.

The sizes of the sets are often varied, inasmuch as a large number of set-dressers are engaged to redress the sets taken up from a street requiring repaving for use in other streets, and what the old sets will redress too often regulates the size of sets used in certain streets.

The accurate gauging of sets is a matter of which the advantage is perhaps not fully realized outside of Liverpool, but it should be noted that if any good work is to be executed the sets when laid should be in parallel and even courses, and if the sets be not accurately gauged to one uniform size the result is either a badly paved street, with the courses running unevenly and bad joints, or the sets have to be picked on the ground, put into courses of various widths, and to be laid in such courses. The cost of this is far in ex-

and perhaps long after the original debt has been recouped, will be trifling. The traffic in certain of the streets in Liverpool is very exceptional, and ranges as follows:

Name of street.	Vehicular traffic in tons per yard in width of carriageway per annum.	Remarks.
Great Howard Street (over wooden pavement).....	301,849 Tons.	.....
Bath Street and New Quay.....	360,000 "	.....
North John Street.....	216,570 "	.....
Lord Street.....	137,484 "	Exclusive of an aggregate tramway traffic of 348,816 tons per annum.
Church Street.....	148,995 "	

The above figures were taken in 1879. If the same were taken at the present time they would show a considerable increase.

As an instance of the quality of the material used it may be stated that sets have been taken up in North John Street which were laid in 1872, with a traffic of 216,570 tons per yard in width of carriageway per annum, and the wear was not measurable. Although the work executed by the Health Committee of the Corporation of Liverpool may often be described as expensive and extravagant, it can be conclusively shown that it is for a public body

THE KANAWHA RIVER IMPROVEMENT.

THE completion of Dam No. 6 of this important work makes it a fitting time to give a description of its most salient details. The first attempts at improvement were made in 1858-59, and consisted in building wing-dams and excavating on the shoals, but the growing demands of the coal and oil interests soon made it apparent that a more thorough system should be introduced. In 1872-3 small appropriations were made and the work of dredging, etc., was begun on a more extensive scale by Col. W. E. Merrill, of the U. S. Engineers. This gentleman also made an elaborate report on the French system of movable dams. In August, 1874, Col. William P. Craighill was placed in charge, and in March following \$300,000 were appropriated by Congress with which to begin the permanent improvement of the river. Soon after this a board of engineers, consisting of Gen. H. G. Wright, Col. W. P. Craighill, and Gen. O. M. Poe, recommended the adoption of the lock and dam slack-water improvement, with movable dams below Point Creek and fixed dams above the same, and in 1875 Locks 4 and 5 were put under contract.

By the plan as now modified there will be three fixed dams and eight movable dams, all with locks between the falls and the mouth of the river.

The estimated cost of the whole improvement is \$4,071,216.

The dams are to be as follows, beginning with the upper :

No. 1 was to have been located at or near the mouth of Loup Creek. This has not been built. No. 2, just below Cannelton and Coal Valley, is now under construction, and is expected to be completed next season. This is a permanent dam, has a lift of 12 feet, and pools the water to Loup Creek, about six miles. No. 3, just below the mouth of Paint Creek, was completed in 1882. This is also a permanent dam, has a lift of 12 feet, and pools the water to No. 2, about 5½ miles. No. 4, below the mouth of Cabin Creek, was completed in 1880. This is a movable dam, with a lift of 7 feet, and pools the water to No. 3, about 5½ miles. No. 5, near Brownstown, completed in 1880, is a movable dam, with a lift of 7 feet, and pools the water to No. 4, about six miles. No. 6, near the mouths of Tyler and Davis Creeks, about 4½ miles below Charleston, just completed, is a movable dam, has a lift of 11 feet at present, which will be reduced to 8¼ when lock and dam No. 7 is constructed, and pools the water to No. 5, about 14 miles. No. 7 will be located about 1¼ miles below the mouth of Coal River, will be a movable dam, with 8¼ feet lift, and will pool the water to No. 6, about 10 miles. This lock and dam will be commenced next spring, if the usual appropriation is made, and be completed about the fall of 1890.

The remaining dams of the series are all to be movable ; their exact locations are not yet fixed, but, approximately, they will be as follows :

No. 8, about two miles below Raymond City, with a lift of 8½ feet, and pool of 7 miles. No. 9, near Alexander's Landing, with a lift of 6½ feet, and pool of 9¼ miles. No. 10, near Debby's Ripple, with a lift of 7½ feet, and pool of eight miles. No. 11, and the last, at the foot of of 3-mile bar, with a lift of 9½ feet, and pool of 16½ miles.

The resident engineer from 1873 to 1876 and again since 1883 was Mr. A. M. Scott. Captain Thomas Turtle was appointed in 1876 and served until 1880, Mr. A. M. Scott being the principal assistant. Captain E. H. Ruffner was resident during 1881-2. Mr. Wm. R. Hutton was employed in making examinations and a report in 1875-6.

From a description furnished to the Kanawha Gazette by Mr. Scott we condense the following description of lock and dam No. 6.

The lock has an extreme length of 410½ feet, and at the top of the mitre-sill the chamber has a length between quoins of 342 feet and a width of 55 feet. It will admit one of the largest tow-boats on the river together with three of the largest-sized coal-barges. Its lift at extreme low water will be 11 feet, but after No. 7 is built it will be 8 feet 3 inches. It is built of first-class cut-stone masonry (smooth-pointed), and is founded on the rock at 11 feet to 22 feet below low water.

The top of the coping is 21 feet 9 inches above the mitre-sills, and the masonry extends 5½ to 16½ feet below the top of same, giving a total height of walls of 27 to 38 feet. The walls are 15 to 19 feet thick at bottom, and 5 to 17 feet at top.

The lock-gates are of white oak, strongly bolted and ironed, each weighing about 38 tons. They rest and turn on steel pivots, and are suspended at top by iron, steel, and bronze fastenings attached to heavy wrought anchors built

in the masonry. The upper fastenings are all below the level of the coping, and are covered with movable cast-iron plates. There are five valves for filling and emptying in each gate.

The movable dam is of the Chanoine type, with Pasquean heurters, and in a later issue we shall give illustrations of this with a full description. The advantage of this method has been long recognized abroad, but until the completion of Dams Nos. 4 and 5 on the Kanawha in July, 1880, it had never been introduced here.

The entire length of the dam between the outer face of the lock-wall and abutment, embracing the navigation pass, the central pier, and the weir, is 568½ feet. The foundations are carried down to the rock at about 12 feet below low water.

The pass is adjacent to the lock and is about 250 feet long. Its sill is 2 feet 7 inches below low water, and it will have 12½ feet of water upon it when the dam is up and the pool full. The pool will be nearly 14 miles long, and the water will be raised 3 feet 9 inches at the foot of No. 5, thus giving 7 feet on the mitre-sill of No. 5, and a 6½-foot navigation everywhere at low water. The pass will be closed by 62 Chanoine wickets, each 3 feet 8 inches wide, and with 4-inch spaces between. The length or vertical dimension will be 13 feet 5½ inches.

Experience has shown that timber is generally more expensive for foundations for such structures than stone-work, and not as durable, and the foundations for the dam, the pass, etc., are therefore all of masonry or concrete. The pass foundation is 50 feet broad up and down stream.

The pass-bridge is composed of 30 wrought-iron trestles. These are nearly 12 feet wide on the bottom, 4 feet 1 inch on top, and 16 feet 8 inches high. They are connected, when standing, by 4-inch "I" beams, which form the track for the manœuvring winch, and light wrought-iron aprons, which make the floor to walk on.

The pass is separated from the weir by the central pier, which is of cut-stone masonry 34½ feet long and 10 feet wide. It is built on bed-rock, and is about 26 feet high, the top of it being level with the top of the service bridge.

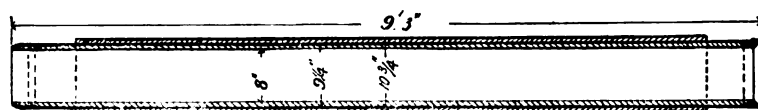
The bridge, when lowered, falls towards the pier, and there is a deep recess in the pier into which the nearest trestle lies when the dam is down.

THE WEIR.

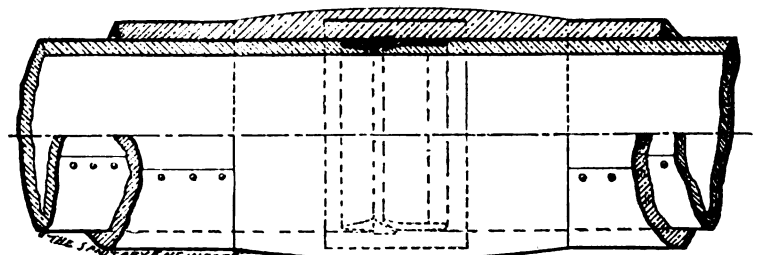
The weir is 310 feet 6 inches long. It is closed with 69 Chanoine wickets each 7 feet 8 inches high and 4 feet 3 inches wide.



8' Composite Pipe



Section showing the relation of Cement and Iron.



Section showing Joint

The weir bridge is like that for the pass in construction, but the trestles are not as high.

They are connected, when standing, by rails and aprons like the pass, and with those of the latter form a continuous track for the traveling winch and a footwalk the whole length of the dam, from the abutment to lock.

A peculiar feature of this weir is the cast-iron sills. The wooden sills, etc., at Dams 4 and 5 of this improvement were found to decay rapidly, and iron was accordingly used at No. 6.

All the foundations were put in by the use of cofferdams. Nearly the whole work was built by contract. Messrs. Harris & Black built the lock, in the years 1881 to 83, inclusive. The dam was begun in 1884 by Messrs.

Harrold & Macdonald, of Pittsburg, and completed in 1886.

The following firms contracted for the various items mentioned : Iron-work for foundations by O. A & W. T. Thayer, of Charleston ; iron for movable parts of Navigation Pass by the Snead & Company Iron-Works, of Louisville, Ky. ; iron for weir, including the winches, by Ainslie, Cochran & Co., of Louisville, Ky. ; the valves and other iron-work for lock-gates, by Ainslie, Cochran & Co.

The timber for the lock-gates by Martz, Kulp, McWilliams & Co., of Cabin Creek, W. Va.

The chains for the pass and weir, by the West Lebanon Rolling Mill, Lebanon, Pa.

The lock-gates and the wickets for the dam were built and hung by hired labor.

The lock-house for lock-keeper and assistants is now being completed under contract with Henry Crawford, of St. Albans, W. Va.

The total cost of Lock and Dam No. 6, including grounds, buildings, and outfit complete, will be a little under \$337,000.

Four men are employed regularly at each lock and dam. The average time taken to raise one of the dams is about nine hours, and it can be lowered in three to four hours.

The amount expended in maintaining and operating the three (then completed) locks and dams on the Great Kanawha, during the year ending June 30, 1886, according to Col. Craighill's report to the Chief of Engineers, is as follows, including repairs, pay of lock-hands, and all expenses :

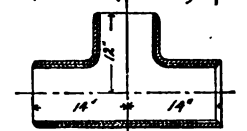
Lock and Dam No. 3 (Permanent Dam).....	\$2,575.63
Lock and Dam No. 4 (Movable Dam).....	2,182.58
Lock and Dam No. 5 (Movable Dam).....	2,245.11

The following gentlemen have also been associated with the engineering department at various times : Lieut. William H. Black, of the U. S. Engineers ; Mr. Thomas E. Jeffries, at No. 6 ; Mr. T. Schoonmaker, at No. 2 ; Mr. A. M. Campbell, Mr. H. V. Estill. The principal inspectors throughout have been Mr. E. H. Kirlin and Mr. John H. Minnick.

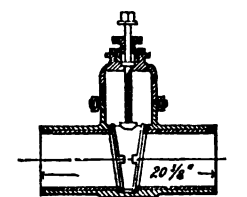
CEMENT-LINED IRON PIPE.

REFERRING to recent opinions in this journal on the durability of cement-lined iron pipe for water-mains, Mr. W. R. Billings sends us a letter inclosing a blue print which he informs us he obtained at a meeting of the New England Water-Works Association, in New Bedford, last June, and

SYSTEM OF COMPOSITE
HYDRAULIC PIPE ADOPTED BY THE
NEW HAVEN WATER CO.—
SHERMAN E. GANNISS, SUPT.



Cement-lined Cast Iron Branch



Cement-lined Gate

says : "Cement-lined pipe, in general, requires special skill, thoroughness, and honesty in laying to secure satisfactory results."

Our illustration is made from the blue print.

LONDON *Builder* says that an International Exhibition of Art, Science, and Industry is to be opened at Saltaire on the 3d of May, 1887, under direction of the Governors of the Salt School, in order to raise funds (\$60,000) to defray the cost of the Schools of Art and Science, which are now being erected as a memorial to Sir Titus Salt.

RECENT WATER-WORKS CONSTRUCTION. No. VIII*.

CAMBRIDGE, MASS., WATER-WORKS.—STONY BROOK SUPPLY.

THE city of Cambridge began the work of securing an additional supply by an application to the legislature of 1881 for the right to take water from the Shawsheen River. This and two subsequent applications were unsuccessful because of the opposition from mill-owners of Andover and from the city of Boston.

At the session of 1883, the city's opponents showed that an equally good supply was to be had from Stony Brook at much less cost than from Shawsheen, and in 1884 the city asked and was given the right to take water from Stony Brook, which is the boundary line between Waltham and Weston.

This stream and its tributaries cover a water-shed of some twenty square miles—a sparsely-settled country where there are but few factories, and these small. Preliminary surveys and borings made in 1884 decided the authorities to locate the first dam near Roberts' paper-mill in Waltham and Weston, at a point on the stream some 800 feet above its junction with the Charles River. Stony Brook rises quickly under heavy rains, and as quickly subsides in a dry time, and ample storage is therefore necessary. At

sand from ten to thirty feet in depth by a steam-hammer in a highly satisfactory manner.

The dam will retain a depth of water varying from twenty-five to thirty feet, but not more than twenty feet is available for consumption.

The structure is of earth, with a stone cove-wall laid in cement, is 750 feet long, 30 feet high, 175 feet thick at the bottom, and 20 feet wide on top.

The water is to be delivered through one mile of 36-inch and 6.6 miles of 30-inch cast-iron pipe, weighing about 275 pounds per foot, into Fresh Pond, whose high-water mark is sixty-four feet below high water in the new reservoir. Fresh Pond, the original source of supply, has been improved and fitted to perform its new duties as a distributing reservoir. Coffin gate-valves are placed about once in each mile of pipe, with air-valves on all summits and blow-offs on all depressions. Some two or three miles of the pipe was laid through private land, the remainder through highways following very closely the inequalities of such ways.

The Superintendent of the Cambridge Water-Works, Mr. Hiram Nevons, laid 5.1 miles of this by the day, the remainder being put in by contract with Henry H. Pike & Son, who are also contractors for the construction of the dam.

it questionable whether it is desirable to make it so absolutely dry that it will pulverize to a fine powder. Some large reservoirs have been built (for example, the Hempstead storage-reservoir on Long Island), by using for the puddle-wall dry clay as it came from the pit, breaking it up fine, then spreading it in layers of about four inches, and rolling it with grooved rollers. Before spreading a layer the previous one is sprinkled lightly. The advantage claimed is freedom from cracks by drying, and the fact that work can be intermitted without damage.—ED. SAN. ENG.]

CLEVELAND, O., ENGINEERS' CLUB.

THE paper of the meeting on November 9 was by Mr. H. F. Dunham, describing the water-works at Menominee, Mich., on Green Bay. A submerged crib was used and was placed 1,000 feet from the shore. The crib was sunk and the pipes laid in the lake while the thermometer ranged from 10° to 22° below zero. Mr. Dunham's explanation of methods resorted to in joining and sinking the pipe was very interesting. The water-works plant at Menominee includes two cribs, and by an ingenious arrangement a back current can be created and either of the lake pipes can be flushed out. One of the cribs is within two or three hundred feet of the shore. Mr. Dunham referred to the unusually poor location for a city at this point. The soil upon which the city of Menominee stands had been created by waste material from the lumber mills. A few years ago it was only a sandbar lying between Green Bay and the Menominee River. Mention was also made of the excellent character of the common laborer there. Mr. Dunham said the men were faithful, although obliged to work in the intense cold.

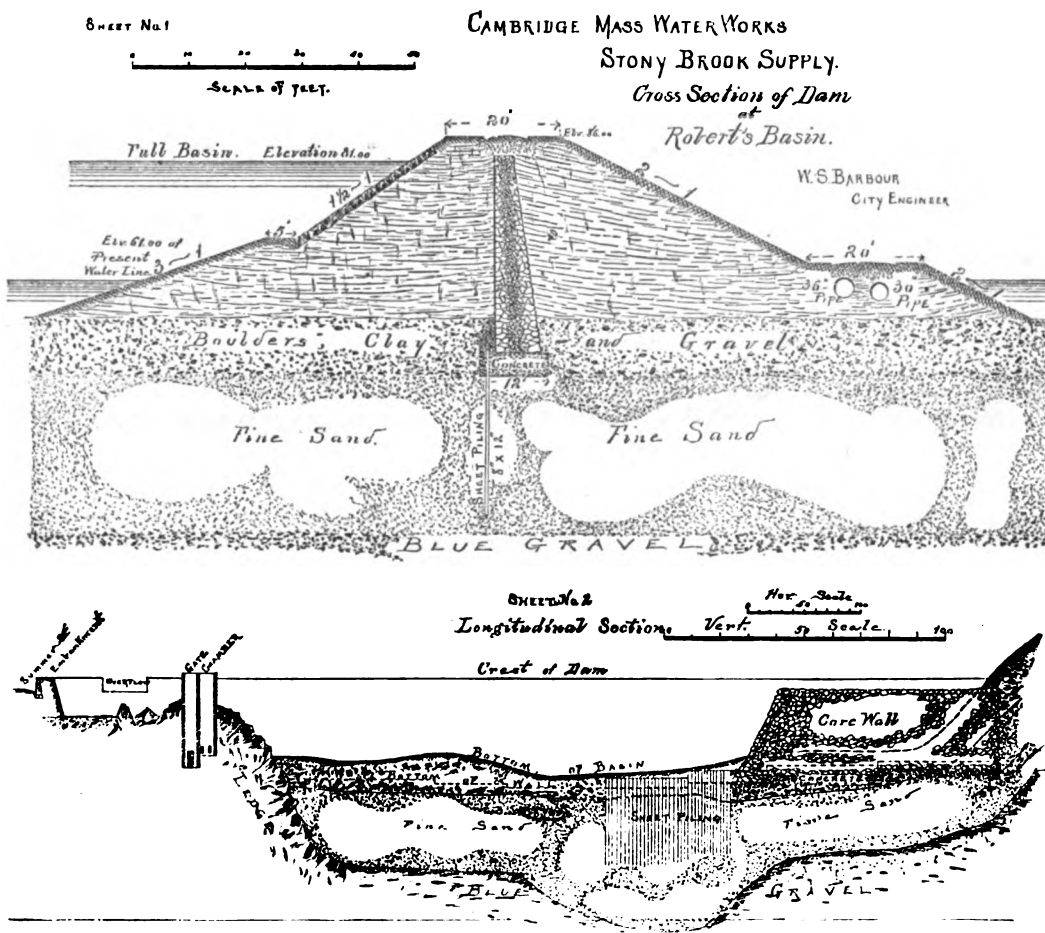
PARIS WATER-SUPPLY.

THE Engineer-in-Chief of the Parisian *Service des Eaux* has just issued his report on the supply of water to the French capital. It has been decided to construct two new aqueducts for the daily supply of 240,000 cubic metres of spring-water necessary to supplement the existing daily supply of spring-water. One of these will bring the water from Verneuil, and the other will collect the springs of La Voulzie and St. Thomas. Each aqueduct will have sufficient capacity to give a future supply of 240,000 cubic metres, so that when they are in full working order Paris will have a supply sufficient to give thirty-eight gallons per day for each individual when the population reaches 3,500,000. This is the present daily supply per head in London, but in addition to the above supply, a large quantity of water is daily drawn from the Seine for flushing purposes.—*Journal of Gas-Lighting*.

CARDIFF, WALES, RESERVOIR.

WATER was recently let into the new reservoir. The cost was about \$350,000. London *Engineer* says the embankment "is 1¼ miles long, while its capacity is over 300,000,000 gallons. It is 56 acres in extent, while its depth varies from 15 feet to 36 feet. The embankment is of the strongest possible description, its greatest width being 265 feet, and its greatest depth 43 feet. Along its centre line a deep trench has been dug until the clay subsoil has been reached, and by puddling clay in this trench the whole has been made perfectly water-tight. At the far end is an arrangement of sluices, by means of which water can be tapped at three different heights. This is to insure freedom from mud or sediment; while at the bottom a scouring-valve will admit of the reservoir being cleaned whenever desired. Mr. Williams, the borough water-works engineer, has given the work sustained attention throughout."

THE new water-supply of Cheltenham, England, has a reservoir which covers an area of about twenty acres, with a maximum depth of 32 feet, and a total capacity of 100,000,000 gallons. There are five filters, having a total area of 12,500 feet, and are capable of filtering 900,000 gallons a day. The filtering material is sand, which is washed by nine ingeniously-contrived machines, worked by a turbine moved by the surplus head of water from the reservoir. The machines were designed by the borough-engineer, Mr. W. M'Landsborough, C. E. From the filters the water runs into five covered tanks of sufficient capacity to store up the water at a regular rate both day and night. The works were executed by Messrs. W. Hill & Co., of Westminster.



some future day other storage-basins will be needed, and can be built near the headwaters of Stony and Hobbs' Brooks, which unite about two miles above the dam now building at Roberts' mill.

This dam will cause a back-flow of about 1¼ miles, covering some 75 acres, and give a storage of 350,000,000 gallons. The site of the dam is attractive both to the artist and to the engineer. The sides of the basin are steep, quite heavily wooded, and dotted with outcroppings of ledge. As shown on No. 2 of the illustrations, one end of the dam pushes into the ledge, and advantage has been taken of this to secure a location for the gate-house, waste-way, and overflow that could hardly be improved.

The preliminary borings along the line of the dam showed a surface crust of gravel, clay, and boulders, averaging about ten feet in thickness, and beneath this a bed of sand of varying degrees of fineness, whose average depth is about twenty-eight feet, and under this is either ledge or very hard blue gravel. The presence of this sand called for thorough work upon the foundations of the dam, and the illustrations show clearly the special means employed to secure this essential.

Sheet-piling eight inches thick and of varying widths from eight inches to twelve inches was driven into the

The maximum daily consumption of water in Cambridge is about 3,000,000 gallons.

The total amount of the contract for building the dam, cleaning and preparing the basin for the water, was about \$135,000, and the engineer in charge expects to see the work completed during the coming fall.

Mr. W. S. Barbour, of Cambridge, is Chief Engineer of the works, with Mr. N. Henry Crafts, of Boston, as Consulting Engineer, and Mr. George Davis, of Cambridge, as Resident Engineer.

DRY CLAY FOR RESERVOIRS.

OUR foreign exchanges mention that a new method of preparing clay for use in preventing leakage of reservoirs and tanks, etc., has just been patented by Thomas Frazier, of King Street, Aberdeen. Starting from the conclusion that in a wet state clay has reached the extreme point of expansion and that water would then filter through it, the patentee, by experiment, arrived at the conviction that by drying the clay and then reducing it to fine powder he would obtain the best results. If, therefore, clay were used for puddling in a dry, compressed state the result of wetting would be to cause its expansion *in situ* and render it water-tight.

[We reproduce this statement to say that there is nothing new in the application of dry clay, although we think

* No. VII., the Water-Works at Watertown, Mass., was published in our issue of September 30, 1886.

The Sanitary Engineer and Construction Record

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VOLUME 14.]

NEW YORK, NOVEMBER 20, 1886.

[NUMBER 2

[TOO LATE FOR CLASSIFICATION.] PROPOSALS.

Office Supervising Architect, Treasury Department, Washington, D. C., November 15, 1886.—Notice is hereby given that the time of opening the bids for the heating apparatus for the public buildings at Columbus, O., Jefferson City, Mo., Pensacola, Fla., Syracuse, N. Y., Council Bluffs, Iowa, and Quincy, Ill., will be extended to December 13, 1886, 2 P. M. M. E. BELL, Supervising Architect.

PROPOSALS FOR DREDGING IN YORK HARBOR, MAINE.

U. S. ENGINEER OFFICE,
PORTLAND, ME., November 18, 1886.

Sealed proposals, in triplicate, for dredging in harbor of York, Maine, will be received at this office, No. 537 Congress St., until 3 P. M., of Saturday December 4, 1886, and will be opened immediately thereafter, in the presence of such bidders as may attend.

All necessary blank forms and full information on the subject will be furnished to parties desiring to bid, on application at this office.

JARED A. SMITH,
Major of Engineers.

SEWER proposals addressed to the City Engineer and indorsed "Proposal for Building Section Six of the South Boston Intercepting Sewer" will be received by the City Engineer, City Hall, Boston, until 12 o'clock M., the 26th of November. The basis for comparison of bids will be the number of working days required to complete the work, together with the Engineer's approximate estimate of quantities of work to be done, as follows: (a), 1,430 linear feet of earth excavation and refilling above grade, in trench for 24 in. by 36 in. sewer; (b), 1,140 linear feet of 15 in. pipe-sewer; (c), 350 cubic yards brick masonry; (i), 2,000 linear feet of 8 in. drain-pipe. Specifications may be obtained and plans seen at the Engineer's office, Improved Sewerage, No. 74 Tremont Street, Boston. William Jackson, City Engineer.



For works for which proposals are requested, see also the "Proposal Column," pages 585 and 586.

CONSTRUCTION.

WATER AND SEWERAGE.

YOUNGSTOWN, O., PUMPING ENGINES.—(By Telegraph. Nov. 16).—The bids opened here November 9 for pumping-engines have been all rejected. New bids will be advertised. D. N. Simpkins is clerk of the Board of Water-Works' Trustees. The trustees withhold information as to prices, at the request of the bidders.

VICKSBURG, MISS., November 15.—A dispatch to the New York Times says:—"Samuel R. Bullock & Co., of New York, made a proposition to the City Council to-night to construct water-works, to be completed in eighteen months; the city to give a grant for thirty years and pay an annual rental of \$70 per year each for 100 public hydrants. The company agree to lay 12 miles of mains and put in double engines. The proposition will most likely be accepted, as it is the best the city has ever had from reliable parties."

CHARLES CITY, IOWA, has decided by vote to put in water-works. C. Mercle, Jr., is Mayor.

STURGIS, DAK.—Water-works are contemplated here. Address Max Hoehn.

HARPER, KAN.—The Harper Water Company has been incorporated. Address George D. Thompson, one of the incorporators.

MACON, GEO.—The water-company will build a 10,000,000-gallon reservoir. Mains will probably be extended.

HOBART, N. Y.—J. S. McNaught, and others, have incorporated the Hobart Water Company.

HUNTINGTON, W. VA., is considering the erection of water-works. Samuel Gideon, President Water-Works Committee.

PLATTSBROUGH, N. Y., is building water-works. J. D. Cook, of Toledo, O., consulting engineer; Turner, Dillaway & Rawson, of Boston, contractors.

GREENWICH, N. Y.—The Greenwich Union Water-Works Company has been incorporated. Capital stock, \$30,000. Henry Gray, and others, incorporators.

GREEN ISLAND, N. Y.—The water-works company of Green Island was incorporated November 12, with a capital stock of \$60,000. The incorporators are: John T. Moffet, Henry C. Hodgkins, John V. Clarke, George B. Basset, Romyne Freeman, Frank Watts, and Francis S. Pecke, all of Watertown, N. Y.

MILWAUKEE, WIS.—City Engineer Benzenberg is satisfied of the practicability of drawing the water-supply from an intake at White Fish Bay. Capt. Breyman, of Toledo, O., will make submarine examinations, and if his report is favorable, it is stated, work will be pushed. Common Council has appropriated \$250,000 of bonds for the work.

JAMAICA, LONG ISLAND.—A committee of the village trustees has been appointed to investigate the provision of a water-supply.

SYRACUSE, N. Y.—The Syracuse Herald of November 17 says: "The New York SANITARY ENGINEER says that a strong sentiment is being developed in Syracuse in favor of getting the city's water from Salmon River by constructing a natural reservoir on the stream and piping thirty-seven miles to the city. The SANITARY ENGINEER is right. The people of Syracuse want plenty of good, cheap water, and they see in Mr. Sweet's project a hopeful undertaking. By next spring we shall know more about this very promising scheme."

BOSTON.—The Water Board has reported to Common Council on the cost of extending water-mains to Germantown, placing it at \$20,000.

HAMILTON, ONT.—The Water-Works Committee has reported that the following bids on pumping-house, boiler-house, wells, and foundations for the new pumping-station be accepted, and contracts entered into: William Hancock, mason work, \$17,000; Robert Chisholm, carpenter work, \$1,989; Messrs. Thomas Irwin & Son, galvanized iron, \$134, and slating, \$405; Messrs. Barker & McBrien, painting, \$410; total, \$19,998. The Board of Aldermen, however, refuses to accept the report, and refers it back to Engineer Haskins for a report by him on the possibility of reducing the cost of the pumping-station.

CHILLICOTHE, MO.—The contract for water and gas-works, has been awarded to Messrs. Comegys & Lewis, New York City. The cost will be about \$75,000, and the works are to be completed by July 4, 1887.

PHILADELPHIA.—On November 30, Philadelphia Councils will consider the ordinance authorizing the lease of the water-works to the South Mountain Water Company.

LOUISIANA, MO.—The contract with Bronson & Foster, of New York City, for the construction of water-works, has been ratified by special election.

LITTLETON, N. H.—The Apthorpe Reservoir Company may be addressed in regard to new pump and extensions of mains.

HULL, ONT.—Water-works, built by G. H. Millard, after plans by Robert Sartees, C. E., of Ottawa, were tested satisfactorily November 10. The cost was about \$10,000.

BELFAST, ME., has contracted with Wheeler & Parks for a system of water-works for fire and domestic purposes. The contractors furnish 55 hydrants for 25 years, at an annual cost of \$1,500. The works are to be completed in a year's time.

GRAND RAPIDS, MICH.—The water committee has reported on the cost of laying 50 miles of water-mains and perfecting the water-supply. They favor undertaking the work.

This action was taken as the result of a report of a special committee on the proposition of the Hydraulic Company to buy the water-works. This committee reported that "it would be suicidal for the city to give up its water-supply," and they recommended that steps be taken at once to improve and enlarge the water-system; that "one or more hydraulic engineers be employed to whom the whole subject of the water-supply be submitted without delay," and that an immediate vote be taken on the raising of \$500,000 to provide the increased supply. George C. Pierce and William A. Berkey, sub-committee of council, may be addressed on the matter.

NEW ORLEANS, LA.—D. M. Hollingsworth, November 2, proposes to the Mayor and Council to furnish water to the 15th and 16th wards, and 5th district, for all purposes, he putting in 25,000 linear feet of pipe, pumping-engines, and filtering apparatus, and 100 fire-plugs; the city to pay \$60 per annum for each fire-plug, and private consumers \$6 per 30-foot front of lot; water to be furnished to manufacturers at 10 cents per 1,000 gallons.

BATH, ME.—The Bath Water-Supply Company has transferred its charter to the National Water-Works syndicate, which is building water-works here. The total cost of the works is about \$200,000.

ALBANY, N. Y.—Dr. Russell, of the State Board of Health, and Surveyor Andrews have submitted to the Board of Contract and Apportionment a plan to convert Martinsville into a park, and the basin into a lake, to be fed from Tivoli through iron pipes. The cost of the pipes is estimated at from \$8,500 to \$11,250. It appears that no action can be taken, however, at present.

HASTINGS, MICH.—The City Council has awarded the contract for the water-works for that city to George C. Morgan, of Chicago, Ill.

ILION, N. Y.—In the matter of having water-works, for some time under discussion, a popular vote has been taken, and resulted in a majority against water. This stops the matter for the present.

MINNEAPOLIS, MINN.—A company is being formed here to build a canal from the Mississippi River, near the Milwaukee Short-Line Bridge, across the loop formed by the bend in the river. The canal will deliver water for power. The capital stock is placed at \$300,000. A charter will be obtained as soon as possible, and work begun at once.

BROOKLYN SEWERAGE.—On November 15 a project for a sewer in North Second Street, Eastern District, was before the Aldermen.

The cost is estimated at \$80,000. The matter has been referred to the Law Committee.

TORONTO, ONT.—The chairman of the Board of Works calls for bids for removing 381,710 cubic yards of earth in the new channel, and 669,310 cubic yards of side cutting in forming channel and roads for improvement of River Don; also 12,000 lineal feet of piles, 30 feet long each, and construction of a channel 2 miles long in Ashbridge Bay.

PITTSBURG, PA.—The East End Sewerage Commission now has under consideration plans prepared by Chief Engineer Bigelow for the Thirty-third Street sewer, 8, 7, 6 and 5 feet in diameter.

BRIDGEPORT, CONN.—A scheme is before the Common Council to provide for the building of a trunk-sewer to take care of the sewage of East Bridgeport and West Stratford, which now goes into Yellow-Mill Pond.

PLUMBING.—The Board of Health of Philadelphia, Pa., will receive proposals until November 26, for altering drainage and plumbing at the Municipal Hospital. William P. Troth is chief clerk of the board.

SCHENECTADY, N. Y.—Address Engineer Baerman about enlargement of water-tanks.

YAZOO, MISS., water famine was so severe last week that water was sold at 25 cents per barrel.

NEW ORLEANS is suffering from a severe water-famine.

BROOKLYN.—Henry Hawkes, Water Purveyor, has just sent in his annual report, in which he urges the importance of the speedy laying of the 30-inch iron force-main from Underhill Avenue pumping-station to Prospect Reservoir.

GAS, STEAM, BUILDINGS, ETC.

ERIE, PA.—The Pennsylvania Natural-Gas Company will have its mains laid and natural-gas turned on to-day, November 20. Mr. Walker is manager of the company in Erie.

MUNCIE, IND.—A natural-gas well was struck by the Muncie Exploring Company November 12. It is proposed to pipe the city for supplying gas as fuel.

NAUGATUCK, CONN.—An electric-light company has been formed here, with L. D. Warner, P. B. Tuttle, John H. Whitmore, E. H. Carrington, and A. H. Dayton as directors.

TIFFIN, O.—The Olean Gas and Oil Company, of Findlay, O., on November 9, gained control of the Tiffin Natural-Gas Company, and will proceed at once to lay mains. The Standard Oil Company is also before Tiffin Council, with a request for the right to lay mains.

MANCHESTER, N. H.—Plans and specifications have been prepared, on which bids will be asked for the construction of a \$12,000 engine-house at the North End. Address Alderman McCrillis, Committee on Lands and Building.

KANSAS CITY, MO.—G. R. Nelson has been appointed superintendent of the new court house to be built here. Proposals for sites are now being received.

ALGONQUIN CLUB-HOUSE.—The members of this club in Boston, Mass., voted, on November 11, to raise the sum of money necessary for erecting the building, of which a description was given in our last issue.

CAMDEN, N. J.—The Board of Education, President Carson, will advertise for proposals for building two school-houses.

NEWPORT, R. I.—Improvements at the "beach," including new buildings, roadways, etc., will be made at a cost of \$31,000. Address the City Engineer of Newport.

RAILROADS AND CANALS.

NEW RAILROAD.—The Cairo, Kansas and Western Railroad, of Chicago, was incorporated last week at Springfield, Ill., to build five lines of railroad. The capital is put at \$10,000,000.

Recently incorporated in Pennsylvania is the Easton and Bangor Railroad, to build from Pen Argyle, 25 miles, to a point on the Lehigh Valley Railroad in Northampton Co.

ADDRESS Ex-Governor Loomis, President of Dayton and Ironton, O., Railroad, about construction of branch road from Wasington Court-House to the Hocking Valley.

DUBUQUE, IOWA.—The Dubuque and Dunleith Bridge Company has under consideration the building of a \$100,000 approach at the easterly end of its bridge.

RAILROAD EXTENSION.—At a meeting of the Memphis and Charleston Railroad, in Huntsville, Ala., November 11, the extension from Stevenson to Chattanooga was authorized. It is understood work will be begun at once.

RECENTLY incorporated is the Leavenworth and Olathe Railroad, Kansas, to build a line between the two places named.

LITTLE ROCK JUNCTION, KY., will fill in tenth approach to Arkansas River Bridge. Estimated quantities: Earthwork, 11,821 cubic yards; macadam, 730 supn. yards; timber, 30,000 feet B. M.; gutter, 372 supn. yards; masonry, 224 cubic yards; rip-rap, 50 cubic yards; culvert, 90 lineal feet. Estimate, \$5,500.

BUILDING AND EQUIPMENT.—On November 8 a reorganization of the Savannah, Dublin and Western Railroad Company took place at Savannah, Geo., the old directors being re-elected, with the addition of three gentlemen from the interior of the State. Gen. Van Fossen, of the United States Construction Company, and J. H. Powers, a railroad builder of Macon, Geo., were at Savannah conferring about the building and equipment of the road.

TUNNEL PROPOSED.—The St. Clair Tunnel Company, to build a tunnel under the St. Clair River, elected directors last week at Sarnia as follows: Messrs. Joseph Hickson, Montreal; John Bell, Belleville, Ont.; Alex. Vidal and Charles Mackenzie, Sarnia; E. W. Meddaugh and W. J. Spicer, Detroit, Mich.; and Joseph Hobson, Hamilton, Ont. At a subsequent meeting of the directors Mr. Joseph Hickson was elected President; Mr. Bell, Vice-President for Canada; Mr. Meddaugh, Vice-President for the United States; and Robert Wright, of Montreal, Secretary-Treasurer. A trial tunnel will be built at once, for which the contract has already been let.

DETROIT, MICH., BRIDGE.—On the 13th inst., the Executive Committee of the Bureau of Construction decided to open correspondence with various bridge companies asking for plans and proposals for building a bridge to Belle Isle. The cost is estimated at \$300,000.

RAILWAY BRIDGE.—W. A. Petersen, Chief Engineer of the Canadian Pacific Railway, is making surveys at Sault Ste. Marie for a bridge at that place. The principal office is in Montreal.

ERIE RAILWAY will extend the Greenwood Lake Road to some point on its main line near Middletown.

IRON BRIDGES.—The St. Paul, Minneapolis and Manitoba Railway and the Minneapolis and St. Louis Railway is compelled by mandamus from Judge Rea to build ten iron bridges over its tracks in St. Paul. Plans have been prepared by City Engineer Rinker, and submitted to Vice-President Truesdell, of the latter company.

CABLE ROAD.—Newly incorporated is the Brooklyn, N. Y., Cable Company, capital \$500,000. The trustees are: Thomas L. Johnson, L. A. Russell, Albert L. Johnson, of Cleveland; A. J. Dupont, of Wilmington; Arthur J. Moxham, of Johnstown, Pa.; Philip R. Voorhees, Henry C. Evans, of New York City.

SUSPENSION BRIDGE.—Bridge men may address the city engineer of Wooster, Mass., on the proposed building of a suspension bridge across the lake. The cost is estimated by H. B. Bigelow, of Lake View, at \$63,000.

THE St. Louis, Arkansas, and Texas Railroad has just signed contracts for the purchase of 20,000 tons of steel rails. The road will make extensions.

DETROIT, MICH.—The work of constructing a bridge over the American channel of the Detroit River, from the mainland to Belle Isle Park, will be pushed vigorously now that the moneys are available. The Secretary of the Board of Construction, J. J. Norris, has been directed to solicit bids and plans from the various bridge builders. The estimated cost of the bridge is \$350,000.

CINCINNATI, O.—Extensive granite paving work will be done by the Board of Public Affairs on Second Street. The appropriation is \$229,039. The City Engineer has prepared the final estimates.

ST. PAUL, MINN., Council is discussing a scheme of extensive street-paving.

ST. PAUL, MINN.—Property owners on Dayton Avenue have decided to pave the avenue from near Summit Avenue to Victoria Street with asphalt-paving thirty-six feet wide. Stanford Newel is chairman of the committee to confer with the Board of Public Works. The street will be sidewalked with hexagonal cement blocks. Nearly 5,000 feet of the avenue was represented at the meeting. Work to be begun as soon as possible.

DOCKS.—The Duluth Chamber of Commerce has adopted a report providing for changing the dock-line, in connection with which the harbor will be improved. For this latter there is an appropriation of \$56,000, and the work will be begun as soon as the dock-line is settled.

MONTREAL, CAN.—The Aldermen have authorized the expenditure of \$28,400 to buy stone to be broken for the streets.

BIDS OPENED.

FRANKLIN, O.—The following bids for sinking, tubing, and connecting five driven wells were received by John W. Hill, consulting engineer, November 6:

BIDDERS.	Bidders.	Description.	Price.	Totals.
* Steam wells.	F. A. Stinson & Co., Dayton, O.	Per foot of 6 inch well-tubes in ground.	\$2.50	
	Smith, Vaile & Co., Dayton, O.	Per foot of 6-inch connections 12 feet deep.	\$2.50	
	A. D. Cook, Lawrenceburg, Ind.	Per foot of 6-inch connections 14 feet deep.	\$2.70	
	J. A. Wagner, Middletown, O.	Per foot of 6-inch connections 16 feet deep.	\$2.57	
		Per foot of 8-inch connections 12 feet deep.	\$3.80	
		Per foot of 8-inch connections 14 feet deep.	\$3.00	
		Per foot of 8-inch connections 16 feet deep.	\$3.25	
		Per foot of 12-inch connections 12 feet deep.	\$5.20	
		Per foot of 12-inch connections 14 feet deep.	\$5.45	
		Per foot of 12-inch connections 16 feet deep.	\$5.70	
+ Sand-bucket wells.		Connections 12-feet depth.	\$1,578.05	
		Connections 14-feet depth.	\$1,697.92	
		Connections 16-feet depth.	\$1,696.93	

Five 6-inch tubed wells, 57.5 feet deep; 138 feet of 6-inch connections; 63.5 feet of 8-inch connections; 63.5 feet of 12-inch connections; three 12-inch x 12-inch x 12-inch flange tees. Prices include all labor, materials, and fittings. Wells capped 2 feet 6 inches under ground.

BUFFALO, N. Y.—The following bid for constructing a fire-boat, as per advertised proposals, were received by the Board of Fire Commissioners November 8: David Bell, Buffalo, N. Y., \$29,500.

CHICAGO.—The Keystone Bridge Company is given a contract by the city to build, for \$2,400, on the Shore Inlet Pier, near the North Pumping-Works, a small wrought-iron light-house.

The Vulcan Iron-Works are given a city contract to provide complete, for \$4,360, the machinery for operating the new Twelfth Street "steam bridge."

Three other small city contracts, aggregating about \$8,000, are given to supply construction iron for the House of Correction addition. The Jones & Loughlin, limited, supply chiefly plate-iron for cells, etc., at \$45 per ton; S. D. Kimbark chiefly bar-iron at \$45 per ton; and Parkhurst & Wilson some "I-beams" at \$70 per ton, etc.

HAMILTON, ONT.—The City Council has opened bids on boilers for the water-works, as follows: Armstrong & Brothers, of Springfield, O., \$2,237.27; J. C. Walton, of Louisville, Ky., \$2,251.40; Brownell & Co., of Dayton, O., \$1,800; W. B. Pollock, of Youngstown, O., \$2,300; Ritchie, Dyer & Co., Hamilton, O., \$3,878; The Erie City Iron-Works, Erie, Pa., \$1,960; The Brightman Stoker Company, of Cleveland, O., \$3,200.

ELMIRA, N. Y.—Bids for the construction of the new armory here were opened in New York, November 9, as follows: S. H. Cotrell, Elmira, \$27,000; Plum & Pulford, Elmira, \$24,300; Walsh, Albany, \$42,000; Albany, \$39,500; W. C. Allington, Elmira, \$25,800; Thomas Gerrity, Elmira, \$25,850; Sullivan & Ford, Owego, \$27,997; Lupton & Neiley, Elmira, \$28,600; E. A. Swan, Elmira, \$25,500; John Dempsey, Elmira, \$23,487. The contract was awarded to Dempsey. Plans are by Pierce & Dockstader.

MILWAUKEE, WIS.—Contracts awarded November 9, 1886, by the Board of Public Works for a new dock on Jones' Island to protect the sewage pumping-works from the encroachment of the lake; Wm. T. Casgrain will furnish piling and timber for \$6.75 per lineal foot, and \$9.50 per cord for "rip rap" stone filling. James Markey's bids were \$7.35 and \$22 respectively.

TOLEDO, O.—The Ohio Pipe Company, of Columbus, O., was the only bidder for furnishing 75 tons of iron water-pipe, 12-inch to 4-inch, for the new asylum. Their bid was \$29.80 per ton for the pipe, and 3 cents per pound for special castings.

THE Puget Sound Company has received a contract from W. Barclay, Los Angeles, Cal., to supply 180,000 feet of wooden pipe for the water-works.

GOVERNMENT WORK.

ST. MARY'S RIVER.—Abstract of bids for improving Hay Lake Channel, Saint Mary's River, Mich., by excavating at Middle Neebish, about twenty foot grades: Henry M. Youmans, East Saginaw, Mich., \$2.50 per cubic yard in bank; Hickler & Green, Sault Ste. Marie, \$2.98; Carlin, Stickney & Cram, East Saginaw, \$3.20; Charles S. Barker, Duluth, Minn., \$3.80; L. P. & J. A. Smith, Cleveland, Ohio, \$4; Green Bay Dredge and Pile-Driver Company, \$4.05; William Upham & Co., Duluth, Minn., \$4.50; George Talbot, Buffalo, N. Y., \$5; Truman & Cooper, Manitowoc, Wis., \$6.50. The bids were rejected.

JACKSONVILLE, FLA.—The following bids for improving St. John's River, Fla. (bar at mouth), shore extension of North Jetty, were received by Lieut. W. M. Black, Corps of Engineers, U. S. A., November 9: Samuel R. Cummings, New York, \$21.98 per lineal foot, total \$7,912.80; Marcus Conant, Mayport, Fla., \$14, \$5,040; J. A. Bryan, Mayport, Fla., \$7.22, \$2,599.20.

BURLINGTON, VT.—The following bid for dredging and removing boulders from Ogdensburg, N. Y., Harbor was received by Major M. B. Adams, U. S. Engineers, November 11: William James Daly, Ogdensburg, N. Y., dredging 50,000 cubic yards 16.9c. per cubic yard; 3 boulders to be removed \$250; total, \$8,700.

WILMINGTON, N. C.—The following bids for dredging in Georgetown Harbor were received by Capt. W. H. Bixby, November 9: Rittenhouse Moore, Mobile, Ala., withdrawn without opening; W. H. W. Morris, New York, 16 cents per cubic yard, scow measurement.

DELTA, MADISON PARISH, LA.—The following bids for constructing levees in the Fifth Louisiana Levee District were received by George C. Wendell, October 18:

"Monona."—A. T. Martin, Waterproof, La., 21 1/2c. per cubic yard; George Arnold & Co., Memphis Tenn., 22c.

Lee.—John McGinty, New Orleans, La., 22.3c. cents per cubic yard; George Arnold & Co., Memphis, Tenn., 23 1/2c.

Wyly.—John McGinty, New Orleans, La., 20c. per cubic yard; George Arnold & Co., Memphis, Tenn., 21c.

Reid.—George Arnold & Co., Memphis, Tenn., 27c.; John McGinty, New Orleans, La., 28c.

Raleigh.—George Arnold & Co., Memphis, Tenn., 19c. per cubic yard; John McGinty, New Orleans, La., 20c.

The total estimate of quantity was rather more than 1,000,000 cubic yards.

WILMINGTON, N. C.—The following bids for furnishing 20,000 tons of stone, also for dredging Cape Fear River, N. C., were received by Capt. W. H. Bixby, U. S. Engineers, November 9: Stone.—W. H. Trump, Philadelphia, \$2.23 per ton delivered at upper end of Smithville Harbor; W. F. Haigh, New York, \$2.16 1/2, ditto; B. G. Bailey, New York, \$1.94 per ton delivered at Wilmington or within 15 miles thereof; George Z. French, Wilmington, N. C., \$1.80 per ton delivered at Zeek's Island, or \$1.62 at Wilmington, N. C., provided that he has use of Government lighters; W. A. Martin, Wilmington, N. C., \$1.52 1/2 per ton delivered at Wilmington, N. C., within the corporate limits.

Dredging.—Ross & Sandford, Jersey City, N. J., 15.2c., per cubic yard, scow measurement; Frank C. Somers, Philadelphia, Pa., 15.9c.; W. H. W. Morris, New York, 14.9c.; American Dredging Co., Philadelphia, Pa., 15 1/2c.; George C. Forbes & Co., Baltimore, Md., 16 1/2c.; Rittenhouse Moore, Mobile, Ala., 15 1/2c.; National Dredging Co., Wilmington, Del., 15 1/2c.; Baltimore Dredging Co., Baltimore, Md., 16c.; Morris & Cumming Dredging Co., New York, 15 1/2c.

NORFOLK VA.—The following bids for dredging Southern Branch of Norfolk Harbor and approaches to same (appropriation \$70,000) were received by Capt. F. A. Hinman, U. S. Engineers, November 11:

BIDDERS.	Price for material excavated from Southern Branch. Per cubic yard.	Price for material excavated from approach to harbor. Per cubic yard.
P. Sanford Ross, Jersey City, N. J., Morris & Cummings Dredging Co., New York	16c.	13 3/4c.
George C. Forbes & Co., Baltimore, Md.	15 1/2	13
National Dredging Co., Wilmington, Del.	17	13 1/2
Byron Clark Howell, New York.	15 3/4	13
John A. Benson & John H. McNeel, Washington, D. C.	23 1/2	18 1/2
	17 1/2	14 1/2
	19 1/2	21

JACKSONVILLE, FLA.—The following bids for improving Volusia Bar, Fla., were received by Lieut. W. M. Black, Corps of Engineers, U. S. A., November 9:

BIDDERS.	Fascines, per cubic yard.	Stone or Concrete, per cubic yard.	New Piles in place, per pile.	Waling Strips, per 1,000 feet B. M.	Chain, per pound.	Sawing off old piers.	Reclaiming old piles.	Total.
R. G. Ryan, Wilmington, N. C.	\$2.00	\$4.50	\$5.00	\$30.00	10c.	\$1.00	10c.	\$6,037.88
George C. DeCotte, Jacksonville, Fla.	2.50	5.50	5.50	30.50	8	25	50c.	7,167.05
Samuel R. Cummings, New York	2 1/2	5.30	5.25	20.00	8	...	\$5.50	6,024.60
J. A. Bryan, Mayport, Fla.	75	4.75	4.50	20.00	10	25	10c.	5,413.18

BUFFALO, N. Y.—Address U. S. Engineer Mann in regard to deepening Niagara River, from Buffalo to Tonawanda, for which plans are now being prepared.

PORTLAND, ME.—The following bids for removing ledge from the Cocheco River, N. H., were received by Major Jared A. Smith, Corps of Engineers, U. S. Army, November 13:

BIDDERS.	Ledge, per cu. yd.	Boulders, per cu. yd.
Thomas Symonds, Leominster, Mass.	\$3.50	\$4.50
George W. Townsend, Boston, Mass.	9.50	5.00
Solon S. Andrews, Biddeford, Me.	14.50	..
B. G. Bailey, 16-18 Exchange Place, N. Y.	19.00	..

The acceptance of the bid of Thomas Symonds was recommended.

PORTLAND, ME.—The following bids for stone for breakwater at mouth of Saco River, Me., were received by Major Jared A. Smith, Corps of Engineers, U. S. Army, November 13:

BIDDERS.	Stone of first class, per ton.	Stone of second class, per ton.	Securing beacon, per ton.
Isaac H. Webber, Chebeague, Me.	\$1.15	\$1.15	\$75.00
John T. Hamilton, Portland, Me.	1.12	1.12	50.00
George Willett Andrews, Biddeford, Me.	.98	.98	10.25
Joseph A. Curitt and Alfred E. Hamilton, Chebeague, Me.	1.07	1.07	30.00
John A. Hamilton, Chebeague, Me.	1.20	1.20	100.00

The acceptance of the bid of George Willett Andrews was recommended.

MISSISSIPPI RIVER IMPROVEMENT.—On November 13, the War Department approved the allotment by the Mississippi River Commission of money for the levee of the Yazoo, Mississippi Delta district. The appropriation will be extended on the line of that levee between Memphis and the north line of Bolivar County, Miss. This, with the work now being done in the district below, will complete a continuous line of levee from Memphis to Vicksburg, a distance of about 320 miles. The Secretary of War has approved the recommendation made by General Gillmore, President of the Commission, that the levee board of engineers be called at once for the purpose of dividing the \$400,000 allotted by the commission for levee work. The board will meet immediately at Memphis and then proceed to New Orleans.

MISCELLANEOUS.

GARBAGE FURNACES.—A test was made last week at Milwaukee of an Engel's garbage furnace in the presence of the Health Commissioner, the Mayor, and members of the Board of Aldermen. The test was satisfactory, and an ordinance will be introduced in the Common Council providing for the burning of night-soil and garbage.

MONTREAL, CAN.—The Commission on the River Floods has decided to make efforts to keep the St. Lawrence River Channel open this winter. Mr. St. George, City Surveyor, is a member of the commission. It is proposed to do this by ice-breaking boats. City Council has appropriated \$2,000 for the costs of an experiment.

ERIE, N. Y.—The Consumers' Gas Company is extending its mains. The work is now progressing.

Building Intelligence.

We solicit from each and every one of our readers information relating to projected buildings in their locality, and should be glad to receive newspaper clippings and other items of interest.

ABBREVIATIONS.—b, brown stone; br, brick; br st, brick store; ds dwll, brown-stone dwelling; apart house, apartment-house; ten, tenement; c, each; o, owner; a, architect; b, builder; fr, frame.

NEW YORK CITY.

4th av, s e cor 66th st, br flat; cost, \$100,000; o, John B. Hillyer; a, H. J. Hardenburg.

S s Houston st, 778 ft e West st, fr chapel and parsonage; cost, \$37,000; o, The Protestant Episcopal Church Missionary Society; a, C. E. Haight.

375 Broome st, br flat and stores; cost, \$23,000; o, Wolf Baum; a, Hert Bros.

BUILDING INTELLIGENCE.

75th st, s s, 209 e 11th av, 3 br dwells; cost, \$45,000; o, W. E. D. Strikers; a, W. G. Merritt & Co.

98th st, s s, 235 e 3d av, 2 br tens and stores; cost, \$28,000; o, L. J. Zimmermann; a, Geo. Mathews & Co.

9th av, s e cor 90th st, br flat and store; cost, \$28,000; o, Thos. Gearty; a, J. C. Burne.

9th av, e s, 25 s 90th st, 3 br flats and stores; cost, \$60,000; o and a, same as above.

90th st, s s, 75 e 9th av, br flat; cost, \$24,000; o and a, same as above.

422 W 27th st, br flat; cost, \$20,000; o, Jas. Robertson; a, M. V. B. Smith; b, A. Smith.

10th av, w s, 255 s 63d st, br flat and store; cost, \$17,000; o, Martin J. Barrow; a, James W. Cole.

116th st, n s, 616 e Av A, br workshop; cost, \$2,000; o, Chas. M. Vandemart; a, C. E. Mullin.

BROOKLYN.

W s Snedeker av, 100 ft from s cor Bay av, fr dwell; cost, \$2,500; o and a, M. H. Gibbons; a, E. J. Morris.

N s of N 7th st, 438 w Kent av, fr storage shed; cost, \$10,000; o, Dick & Meyer.

S s 14th st, 122 w 7th av, br dwell; cost, \$3,800; o, H. C. Bull; a, Wm. E. Kay.

N s Grove st, 115 e Evergreen av, 3 fr dwells; cost, each, \$3,500; o, a, and b, J. H. G. Simonson.

68 Macon st, semi-detached villa; cost, \$15,000; o, Wm. Boswell; a, Montrose W. Morris; b, Thomas B. Rutan.

N w cor Patchen and Marion st, 2 fr tens; cost, \$5,000; o, a, and b, H. Grisman.

N w cor Butler st and 5th av, 2 br stores and dwells; cost, \$16,000; o, Dan Buckley; b, John Donahue.

S side E st, Parkway, 25 w Madison av, fr dwell and store; cost, each, \$2,700; o, H. Thiele; b, W. Max.

N s Herkimer st, 25 e Sackman st, 2 fr dwells; cost, each, \$2,500; o, John Gregory; a, A. Hill.

210-212 Freeman st, 17th Ward, 2 fr tens; cost, each, \$7,600; o, Sarah A. Hendrickson; a, W. J. Valentine; b, R. Gasser.

N e cor Atlantic av and Adams st, fr ten and stores; cost, \$4,500; o, Louis Ridle; a, H. Volweiler.

N s E N Y av and 54 w Alabama av, fr dwell; cost, \$3,600; o, Adolph Bookman; a, H. Volweiler; b, W. Anderson.

S s President st, 92 w 7th av, 4 br dwells; cost, \$40,000; o, John Cassidy; a, F. A. Minerth.

S s 17th st, 120 w 9th av, fr dwell; cost, \$2,500; o, Daniel Connell; a, Michael McCadden; b, Thomas Seward.

57-59 Reid av, e s, 25 s Lafayette av, 5 br tens and stores; cost, \$42,000; o, Henry Fullen and C. F. Bussing; a, Fred Halsted and Thomas Engelhardt; b, W. Reynolds.

N s Monroe st, 390 w Throop st, 3 br dwells; cost, each, \$4,500; o, Elizabeth Phelan; a, T. Floyd Thomas; b, James Phelan.

E s Christopher st, 125 s Blake av, br ten; cost, \$2,200; o and b, John G. Theurer; a, Chas. L. D. Spadthoff.

S s Bergen, 225 e of Kingston av, br dwell; cost, \$5,000; o, Col. Wm. Hemstreet; a, F. Keith Irving.

N s Greene av, 234 e of Lewis av, 7 br dwells; cost, each, \$5,000; o and a, David W. Reeve and Geo. L. Moore.

S s 46th st, 240 w 4th av, fr dwell; cost, \$2,500; o, Geo. Bunnell; a, H. L. Spicer.

W s Underhill av, 81 n Mark's pl, 2 br stores and dwells; cost, each, \$5,000; o, George R. Brown; b, L. E. Brown.

N e cor Pacific st and 4th av, 3 br tens; cost, \$27,000; o, Con. Donellen; a, Geo. P. Chappell.

N e cor 3d av and 15th st, 2 br stores and dwells; cost, \$16,000; o, Phebe L. Gerner and C. M. Spader; a, W. J. Conway; b, Thomas Conway.

N e cor Sumner av and Hancock st, 2 br stores and dwells; cost, \$22,000; o, A. K. Buckley; a, W. H. Burhaus.

E s Hamburg av, 50 s Melrose st, fr store and ten; cost, \$4,800; o and b, Wm. Bayer; a, Frank Holmberg.

BUILDING INTELLIGENCE.

N w cor cor. Flushing and Marcy av, 2 stores and tens; cost, each, \$5,000; o, a, and b, H. Grisman.

E s Duffield st, 50 s Willoughby st, br ten; cost, \$15,000; o, A. W. Shepard; a, J. G. Glover; b, J. A. de Camp.

S s Marion st, 23 w of Marcy av, 2 br dwells; cost, each, \$6,000; o, Charles G. Reynolds; a, A. Hill.

W s 5th av, 80 s Butler st, 2 br stores and dwells; cost, each, \$10,000; o, and a, A. G. Calder; b, N. M. Calder.

Greene av, n s, 100 e Nostrand av, 4 3-story and bmt b s dwell; cost, each, \$7,000; o, J. P. Puels, cor Nostrand and Lexington avs; a, Amzi Hill.

89 Luquer st, n s, 4-story br ten; cost, \$6,000; o and b, John F. Nilson, 28 Manhas-set pl; a, George Damen.

35 and 37 Columbia pl, e s, 2 5-story br tens; cost, each, \$10,000; o, Thomas Minford, 103 Wall st, New York; a, W. Field & Son, New York; b, R. Healy.

Stanhope st, s s, 100 e Hamburg av, 10 2-story fr (br filled) dwells; cost, each, \$3,000; o, Alonzo M. Sager, 1248 Bushwick av; a, John E. Sager.

Somers st, s e cor Sackman st, 2 3-story fr stores and dwells; cost, each, \$3,500; o and b, Mrs. Dora J. Fagan, 148 Somers st; a, Th. Engelhardt.

341-343 Jefferson av, 2 3-story and bmt br dwells; cost, \$6,000 and \$8,000; o, a, and c'r, Colson & Reiners, 122 Tompkins av; m, Jas. Rickard.

Graham av, e s, 60 s Broome st, 2 3-story fr (br filled) dwells; cost, each, \$3,200; o, Rorden & Kohlmann, cor Van Cott and Oakland avs; c'r, Thomas Kepple, m, M. Vogel; a, F. Weber.

Pacific st, s s, 200 w New York av, 2-story and attic br and stone dwell; cost, \$14,000; o, Jeremiah Johnson, Jr., 69 Liberty st, New York; a, Geo. P. Chappell; m, J. Ashfield & Son; c, M. C. Rush.

Skillman st, w s, 150 e Myrtle av, 3-story br dwell; cost, \$6,000; o and b, George Browley, 250 Steuben st; a, M. J. Morrill.

Central av, n w Green av, 2 3-story fr stores and tens; cost, \$8,700; o and b, L. Kunz, 251 Central av; a, F. Holmberg.

Bushwick av, s e cor Schaeffer st, 2 2-story and bmt fr (br filled) dwells; cost, each, \$2,500; o, a, and b, J. W. Lamb, 32 Bushwick av.

Conselyea st, s s, 100 w Ewen st, 2 3-story fr (br filled) tens; cost, each, \$4,000; o and b, Stephen J. Burrows, 236 Ainslie st; a, Th. Engelhardt.

Degraw st, s s, 156.8 e 4th av, 5 3-story and bmt b s dwell; cost, each, \$3,500; o, George R. Brown, 34 S Portland av; b, L. E. Brown and J. F. Kentana.

Stockton st, s s, 1.10 e Marcy av, 10 3-story fr (br filled) stores and tens; cost, total, \$40,000; o and b, George Straub, 22 Ditmars st; a, Th. Engelhardt.

Bushwick av, n e cor Linden st, 2-story fr dwell; cost, \$5,000; o, J. E. Rhodes, 122 Penn st; a, Constable Bros; b, E. D. Garnsey.

Nostrand av, n e cor Ellery st, 3 3-story fr (br filled) stores and tens; cost, each, \$4,500; o, George Straub, 22 Ditmars st; a, Th. Engelhardt.

ALTERATIONS, NEW-YORK.

1715 Washington av, fr dwell; cost, \$4,000; o, Lewis Moore; a, Jas. P. Clark.

59th st, e s Western Boulevard, s s 61st st, and w s 8th av, riding academy bldg; cost, \$10,000; o, N. M. Jewett; a, H. J. Dudley; b, John G. McMurray.

N w cor 38th st and Broadway, br store; cost, \$10,000; o, John G. Wendel; a, Max Schroff.

34 W 14th st, br office bldg and store; cost, \$3,000; o, M. A. Hoppock Est.; a, Benard Simon; b, Sam T. Acken.

2231-33 3d av, br public bldg, meeting rooms and stores; cost, \$1,500; o, Wm. G. Wood, MD; a, Bart Walker.

59 Stanton st, br dwell and store; cost, \$1,500; o, F. G. Schiller; a, Wm. Graul.

26th and 27th st, br place of amusement; cost, \$3,500; o, Adam Forepaugh Lessee; a, H. J. Hardenburg.

160 W Broadway, br dwell and store; cost, \$4,000; o, Peter Roberts; a, same as above.

2726 3d av, fr dwell; cost, \$1,300; o, Suburban Rapid Transit Co; a, A. Nauman.

BUILDING INTELLIGENCE.

610 E 144th st, fr dwell; cost, \$1,200; o and a, same as above.

51-53 Pike st, 2 br dwells; cost, \$2,000; o, Ascher Heinstein; a, Henry Dudley.

ALTERATIONS, BROOKLYN.

46th st, n s, 100 w Kent av, br dwell; cost, \$1,000; o, P. Weidman Cooperage Co; a, Th. Engelhardt.

S s Atlantic av, 75 e Court st, br dwell; cost, \$2,300; o, Arthur Heany; a, and b, W. Freeman's Sons.

96 N 6th st, br dwell; cost, \$2,500; o, Armour & Co; a and b, J. W. Moyer.

613 Kent av, br dwell; cost, \$1,500; o, Ed J. McDonald; b, P. J. O'Brien.

MISCELLANEOUS.

ARGYLE PARK, ILL.—Fr dwell with s foundation; cost, about \$10,000; o, J. M. Lambert; a, Rae & Wheelock; b, not let.

ALBERT LEA, MINN., proposes to build a new court house.

BRIGHTON PARK, ILL.—Block of br dwells, 245x60 feet; cost, \$50,000; several different owners; a, W. A. Furber; b, not let.

BLUE ISLAND, ILL.—Br and iron powder house; cost, \$11,000; o, E. S. Rice; a, J. T. Long; b, J. H. Gray.

52-54 Franklin, remodeling store bldgs; cost, \$11,000; o, Chicago Drug & Chemical Co.; a, O. H. Matz.

North Side, br and s flats; cost, \$14,000; o, J. Loveland; a, Fred Keltovich.

BROOKLYN.—Architect B. B. Eastman has recommended to the Board of Charities altns on the Asylum Building to cost \$50,000.

BALD KNOB, ARK.—2-story fr business bldg; o, B. H. Lumpkin; a, J. W. Wade.

BALTIMORE, MD.—Architect Benjamin B. Owens is preparing plans for 3 br dwells on Townsend st, for Mr. Chas. F. Pitt, Jr. Estimated cost, \$12,000.

Caroline and Oliver, 10 3-story br dwells; o, Sam'l P. Bayne.

Eutaw Pl and Laurens, 3-story br dwell; o, Martin Hawley.

12 N Gay, 4-story br warehouse; o, Thos. Philbin.

Caroline and Preston, 2 3-story br dwells; o, Thos. M. Bradford.

CLEVELAND, O.—St. Clair, br and stone bldg; cost, \$30,000; o, J. Schriber & Co.; a, F. C. Bate; b, John Watterson.

Pearl, br and stone bldg; cost, \$25,000; o, R. R. Rhodes; a, J. M. Blackburn.

Superior, 2 brown stone bldgs; cost, \$125,000; o, J. H. Wade; a, Sam. Lane; b, Thomas Simmons.

Ontario, 2 terra-cotta and stone bldgs; cost, \$60,000; o, Steinfield, Heslain & Schlahtes; a, Lehman & Schmitt; b, H. Lindhorst.

Euclid, cor Erie, br and brown stone bldg for the Cyclorama and business houses, with suites of rooms above 1st floor; cost, \$300,000; o, Cyclorama Co.; a, Schweinfurth Bros.; b, H. Slatmyer.

CINCINNATI, O.—67 Moore st, 3½-story br bldg; cost, \$7,500; o, Ellick & Co; b, W. E. Baker.

8th st, w of Mound, 3-story br bldg; cost, \$7,500; o, Dr. Wright; b, G. F. Liener.

2d, bet Plum and Elm, 3-story br bldg; cost, \$7,600; o, Lomas Bridge Co; b, Smith & Williamson.

6th st, 4-story warehouse; o, Jos. C. Butler estate; a, E. Anderson.

Kennedy Station, fr residence; o, L. Kennedy; a, E. Anderson; b, Phillip Smith.

Eighth st, apart house; o, Miss S. J. Gillespie; a, E. Anderson; b, Clinton Buntin.

CHICAGO, ILL.—39th, near Cottage Grove av, br store and flats; cost, \$15,000; o, Mrs. N. F. Nickerson.

704-08 W Van Buren, br store and dwell; cost, \$17,000; o, John A. Baldwin.

3840-44 Ellis av, br dwell and barn; cost, \$16,000; o, R. J. Taylor.

3831 State, br st and flats; cost, \$10,000; o, J. W. Cochrane.

531 Noble, br st and flats; cost, \$10,000; o, W. D. Dyniewicz.

BUILDING INTELLIGENCE.

CHICAGO, ILL.—27 Chicago av, br store and dwell; cost, \$12,000; o, A. Burton.
350-66 Hawthorn, br machine shop; cost, \$12,000; o, Godley & Strom.
22d, near Prairie av, br apart house; cost, \$35,000; a, W A Furber; b, not let.
Congress and Robey, br apart house; cost, \$12,000; o, John Williamson; a, A E Hinsdale; b, not let.
Superior, n Lake, 3 s and br dwells; cost, \$16,000; o, Walter Newberry; a, C L Stiles; b, not let.
456-58 La Salle av, 2 br apart bldgs; cost, \$22,000; o, Geo Roch; a, Jul Zittel; b, not let.
Harrison, near 5th av, 4-story br store bldg; cost, \$18,000; o, C Rupert; a, J Zittel; b, not let.
Cor Huron and Curtis, 3-story br flats; cost, \$13,000; o, Geo Sandler; a, G Isaacson.
552-54 W Madison, br st and dwell; cost, \$28,000; o, Hy Corwith; a, L B Dixon.
S w cor Leavitt and Adams sts, s and br church; cost, \$23,000; o, Leavitt Street Congregational Church; a, Edbrooke & Burham.
16-26 Troy, 6 br dwells; cost, \$14,000; o, W J Anderson.
106 Astor, br dwell; cost, \$17,000; o, P H Smith; a, W L B Jenney.
859 Monroe, br dwell; cost, about \$10,000; o, Geo W Parks.
3213 Groveland Park av, br dwell; cost, \$11,000; o, J A Farwell.
3214 Groveland Park av, br dwell; cost, \$11,000; o, J B Mallers.
Park Manor (68th st), 5 br and fr dwells; cost, \$19,000; o, W O Parker; a, Rae & Wheelock.
Van Buren, nr Winchester av, br store and flats; cost, \$14,000; o, Mr Baldwin; a, A J York.
Racine, nr Wrightwood, br store and flats; cost, \$15,000; o, G Paterson; a, Ostling & Bourgeois.
47th, s, br, and slate dwell; cost, \$16,000; o, J S Belden; a, H F Starbuck; b, Adams & Williams.
3538 Ellis av, br dwell; cost, \$12,000; o, L. A. Eliel; a, Adler & Sullivan.
30 Clay, br flats; cost, \$10,000; o, E. G. Pauling; a, same as above.
N e cor Michigan av and 26th st, st and br dwell; cost, abt, \$45,000; o, David K. Hills; a, Burnham & Root; b, not let.
S e cor Canal and Lake, 5-story store bldg; cost, \$90,000; o, Julius Wadsworth; a, Burling & Whitehouse; b, not let.
Jackson, between 5th av and Franklin, 7-story business block; cost, \$100,000; o, E. H. & E. B. Sheldon; a, Burling & Whitehouse; b, Barney & Rodatz.
Ontario, east of St. Clair, 3 br and stone dwells; cost, abt, \$33,000; o, E. H. Sheldon and others; a, Burling & Whitehouse; b, not let.

DETROIT, MICH.—Michigan av, br store; cost, \$16,000; o, C B Hubbard; a, W E Higginbotham.
176 Lafayette av, br dwell; cost, \$17,000; o, D Scotten; a, W Scott & Co; b, A T Holmes.
132 3d, br dwell; cost, \$12,000; o, D Scotten; a, W Scott & Co; b, A T Holmes.
549 Fort, br store; cost, \$12,000; o, D Scotten; a, W Scott & Co; b, A T Holmes.
14th, br school house; cost, \$42,000; o, St Vincent Society; a, W Scott & Co; b, J Finn.

GAINESVILLE, TEX.—3-story br hotel; cost, \$22,000; o, J M Lindsay; a, T W Wood.

HYDE PARK, ILL.—Br dwell; cost, \$11,000; o, Chas G French; a, Sprague & Newell.

HYDE PARK, ILL.—S and fr dwell; cost, \$10,000; o, P F Munger; a, G Isaacson.

IRONTON, O.—Br and s bldg; cost, \$22,000; o, St Mary's R C Church; a, A Druiding; b, not let.

JERSEY CITY, N. J.—The Board of Freeholders will expend \$35,000 on alterations of the court house. Plans by Superintendent Kelly.

BUILDING INTELLIGENCE.

KANSAS CITY, MO.—Address George W H Hale, Grand Avenue Hotel Company, in reference to the new building to be erected here.
A building for the Y M C A, will probably be commenced this fall. Estimated cost, \$65,000. Messrs Burnham & Root, of Chicago, are the architects.

KANE, PA.—Limestone church, with spire 143 feet; cost, \$18,000; o, St Joseph's R C Church; a, A Druiding, Chicago.

LAKE VILLA, ILL.—4-story fr and s summer hotel; cost, \$20,000; o, E J Lehmann; a, Treat & Foltz.

LAKE, ILL.—Br brewery bldgs; cost, \$100,000; o, Ernest Tossetti Brewing Co; a, F W Wolf.
Br and s school house; cost, \$28,000; o, Town; a, J T Long; b, T A Westberg.
Br and s school house; cost, \$17,000; o, Town; a, J T Long; b, E W Sproul.

MALDEN, MASS.—Address the Boston and Maine Railroad, James T. Furber, Boston, General Manager, about new depot to be built here.

MONTREAL, CAN.—The contract for masonry work on the Bonaventure depot has been awarded to Plaute & Dubue, of Montreal.

MANDAN, DAK.—A \$20,000 hotel is being put up by C K Ballard, late of the First National Bank.

MILWAUKEE, WIS.—In progress: country residence at "Brocken Brac" farm; plans by James Douglas; o, John Johnston; cost, \$6,000.
Factory building on Erie st; o, L Myers, Eagle Lye Works; cost, \$10,000; a, C A Gombert.
Country residence near St Louis, to be built after plans by C A Gombert; o, John B Buss.

MINNEAPOLIS, MINN.—The building which Messrs. Murch and Tuttle have arranged to put up on Hennepin av, next to the West hotel, will cost about \$75,000, and will be of stone and plate-glass.

NEW ORLEANS.—In progress: Among noted public buildings is the Southern University, 3-story brick edifice. This will be finished about January 1st, 1887, and will cost \$40,000.
Another enterprise is the building of a large 3-story br Jewish Widow and Orphans' Home, the corner-stone of which will be laid November 5. It will cost, including the grounds, about \$75,000. It is located on St Charles av, not far from the Exposition Grounds.
Adjoining the above is the four-story brick college building for colored-pupils, which is being erected by the Methodist Episcopal Church. Its cost will be about \$50,000. It is nearly ready for slating. On the corner of St. Charles Avenue and Sixth Street is the church building which is being erected for the parish of "Christ Church." It will cost about \$75,000.
In the French part of the city is the establishment of the Southern brewery, to which is being added a large five story brew house whose walls are now about twenty five feet high. It is to be filled with the latest improved brewing machinery and will cost over \$100,000. Recently a contract was let for another addition to this establishment to consist of one of the most spacious refrigerating cellars in this city. It will be three stories above ground. Its cost will exceed \$55,000.
The Texas Pacific Railroad Company have recently accepted bids for the erection of a spacious freight depot in Goulsboro opposite New Orleans.

NORTH ADAMS, MASS.—South st, 2-story fr cottage res; cost, \$5,000; o, O L Brouthers; a, H P Fielding; contract not let.
2-story fr mill, 60x175; cost, \$6,000; o, Blackington Mill Co; a, M F Cummings; b, day's work.

BUILDING INTELLIGENCE.

PHILADELPHIA, PA.—In progress: the Industrial Home for Boys, at Eddington. The work will include the erection of several buildings. Corner stone laid November 14. Address Archbishop Ryan, of Philadelphia.
Salmon, bet Lefevre and Orthodox, 2 dwells; b, Amos B Crosta.
Cresson, bet Dawson and Adams, 2 dwells; b, Chas E Bartle.
Orion, ab Wallace, 2 dwells; b, W J Shedwick.
Bunghurst, bet Main and Wakefield, 2 dwell; b, William Garvin.
Tasker, bet 20th and 21st, 3 2-story dwells; o, John Brennan.
Oriana, bet Somerset and Cambria, 2 3-story dwells; b, Wm Armstrong.
Warnock, bet Somerset and Cambria, 6 2-story dwells; b, Jos Lomax.
32d, bet Wharton and Reed, 5 2-story dwells; b, Timothy D Murphy.
24th st, bet Walnut and Locust, saw-mill; b, J K Freedley & Son.
Centre, bet Evans and Hancock, br storage bldg; b, Thos W Wright & Son.
Alleghany av, e 35th, 2 dwells; b, C. C. Lenahan.
5th, above Westmoreland, 2 dwells; b, Wm. Tecklenburg.
21st, bet Reed and Longlane, 8 2-story dwells; b, W. A. Brown.
Reed, bet Lambert and 21st, 3 2-story dwells; b, W. A. Brown.
Amber, s Alleghany, 6 2-story dwells; o, Chas. Spoerl.
Sumac, n Wetherill, 10 3-story dwells; b, A. A. Harmer.
633 Reed, 1 dwell; b, J. W. Kuhn.
Beal and Ball, 2-story machine shop; o, J. P. Morris Co.; b, Alex. T. Richards.
Penn and Bellefield, 8 2-story dwells; b, Wm. Garvin.
Stellman, above Columbia av, 11 2-story dwells; b, Michael Magee, Jr.
Buttonwood, bet 13th and Broad, 4-story br factory; b, M. McManus.
Bainbridge, bet 17th and 18th, 8-story dwell; b, Jas. McConnell.
10th, bet Schiller and Humboldt, 3 2-story dwells; o, E. Thompson.

PROVIDENCE, R. I.—Governor st, e s, fr dwell; o, Truman Beckwith; a, H Hoppin.

RIVERTON, N. J.—Address William H Brown, Chief Engineer of Pennsylvania Railroad, 233 S 4th st, Philadelphia, about the new depot to be built here. Bids were opened November 20 (to-day).

READING, PA.—5th and Woodward, 2-story bldg, with mansard roof and b s trimmings, with corner tower finish; cost, \$9,500; o, Mr Hart; b, J Fricker.
9th and South, 4-story br brewery; cost, \$14,500; o, Reading Brewing Co, Philip Bissing, manager; b, L Focht.
7th and South, large pipe mill; cost, \$12,500; o, Reading Iron Co, F Smink, manager.

ROSELLE, N. J.—Plans are being prepared for a new hotel on the site of the Hotel Windsor.

SIOUX FALLS, DAK.—A stock company has been organized, which will at once rebuild the pork and beef packing house of Jackson & Smith, recently burned. The company is composed of Messrs. Jackson & Smith, Leslie Thompson, W W Brookings, H J Davenport, and J G Eddy.

SOUTH PITTSBURG, PA.—A stock company will build pipe-works here. G E Downing, President; James Bowron, Nashville, Tenn, Vice-President.

BUILDING INTELLIGENCE.

SOUTH BEND, IND.—Br factory; cost, \$30,000; o, Wilson Bros, Chicago; a, W W Clay, Chicago; b, not let.

SAN FRANCISCO, CAL.—In progress, Inventors' Institute Hall, 10th and Market sts; architect, John Gash; cost, with machinery, \$106,000; contractor, Geo D Nagle.

ST. PAUL, MINN.—Pleasant st, bet Oakland and Dale, stone bmt and foundation to dwell; cost, \$7,350; o, R A Door.
Goodrich av, bet Forbes and Douglass sts, 2-story frame dwell; cost, \$5,000; o, F L Schram.
The Hudart Scale Manufacturing Company, of Cincinnati, will move their plant to St Paul, and will begin this fall the erection of buildings, the main one to be 60x100 feet in size, two stories high. The total value of the plant when moved will be \$50,000.

SPRINGFIELD, MASS.—Fort st, br business block; cost, \$20,000; o, Fire and Marine Ins Co; a, W S Baxter and E W Shattuck; b, Royal Harrington.
Cor Matoon and Elliott, double br dwell; cost, \$12,000; o, L C Smith; a, Richmond & Seabury; b, Burnham.

TRAVERSE CITY, MICH.—Fr church; cost, about \$10,000; o, St Francis' R C Church; a, A Druiding; b, not let.

TROY, N. Y.—341 8th st, 3-story br flats; cost, \$5,500; o, S Dollar; a, M F Cummings; a, G Henderson.

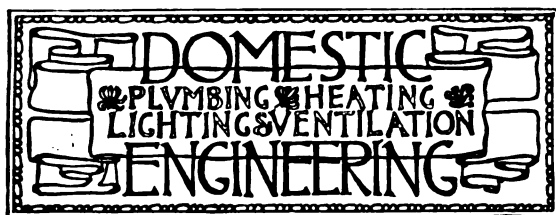
UNION STOCK YARDS, CHICAGO.—Br office bldg; cost, \$10,000; o, *Live Stock Reporter*; a, H R Wilson; b, not let.

WASHINGTON, D. C.—The United States Electric-Light Company will build a station, 100x120 feet, on 13 1/2 and B sts, N W. M G Emery is chairman of the committee.
R I av, bet 14th and 15th, 3-story br bldg; cost, \$8,500; o, Joseph Tyesowski; a, T F Schneider; b, J B Williamson.
6th st, extended, 2 2-story br bldgs; cost, \$5,000; o and a, D B Groff.
O, bet Congress and High, 3-story br bldg; cost, \$30,000; o, trustees, Linthicune Institute; b, H H Law.
L, bet 12th and 13th, 2 3-story br bldgs; cost, \$16,000; o, Petney & Bradford.
E, bet 21st and 22d, 7 2-story br bldgs; cost, \$8,500; o, Oliver Cox.
G, bet 19th and 20th, 6 3-story br bldgs; cost, \$35,000; o, John Cassells; a, J G Hill; b, C C Martin.
Conn av, bet R and S, 3-story br bldg; cost, \$20,000; o, G W Brown; a, J B Gray; b, John McGregor.
6th and A, N E, 1-story br bldg; cost, \$7,000; o, Met Baptist Church; a, J Stewart; b, T Lowell.
M, bet 9th and 10th, 3-story br bldg; cost, \$5,700; o, F C Dennison; a, T J King.
M, bet 9th and 10th, 3-story br bldg; cost, \$6,000; o, M D Cook; a, T J King.
Conn av, bet N and M, 3 story br bldg; cost, \$20,000; o, J A Rodgers; a, Hornblower & Marshall; b, W C Morrison.
Corcoran and 16th, 3-story br bldg; cost, \$6,000; o, F W Hackett; a, Hornblower & Marshall; b, W C Morrison.
1408 M st, 3-story br bldg; cost, \$16,000; o, J T Arms; a, J B Gray; b, W C Morrison.
Fifty-one permits less than \$5,000 in value.

WORCESTER, MASS.—Nothing to report this week over \$5,000.

WOODLAND, O.—Fr villa; o, Mrs K K Bergher; a, E Anderson; b, M Rabbett.

WEST SPRINGFIELD, MASS.—Frame dwell; cost, \$7,000; o, Jason Palmer; b, W Madison, of Palmer, Mass.



STANDARD THREADS FOR WROUGHT-IRON STEAM AND GAS-PIPES.

At a meeting of the manufacturers of wrought-iron pipe and boiler-tubes, held at Pittsburg on October 27, a resolution was passed adopting the Briggs standard of gauges for threads on wrought-iron steam, gas, and water-pipes.

This will give an absolutely uniform standard for pipe threads among the leading makers of wrought-iron pipe in the United States, and will form an era in the history of pipe manufacture. It can justly be looked on as a direct and needed advancement in the science of manufacture, and will be of an incalculable benefit to the water, steam, gas, and kindred industries, in that the pipes of different makers will be absolutely interchangeable if the makers carefully follow what is known as the Briggs standard. The Pratt & Whitney Co., of Hartford, Conn., through the endeavors of Mr. George M. Bond, are prepared to furnish the standard gauges, which are founded on the formulæ given below in Mr. Robert Briggs' own words, taken from the transactions of the Institution of Civil Engineers, of which he was a member:

"A longitudinal section of the tapering tube-end, with the screw-thread as actually formed, is shown double full size in Fig. 1 for a nominal $2\frac{1}{2}$ -inch tube—that is, a tube

their corresponding numbers of screw-threads per inch, the actual internal diameter d is expressed by the following table in terms of the actual external diameter D :

Diameters of Wrought-Iron Welded Tubes for Warming by Steam.

Nominal Internal Diameter of Tube.	Number of Screw-Threads per inch.	Actual Internal Diameter d in terms of Actual External Diameter D .
Inches.	No.	Inches.
$\frac{1}{8}$	27	$d = 0.0631 D - 0.1204$
$\frac{1}{4}$ and $\frac{3}{8}$	18	$d = 0.0622 D - 0.1556$
$\frac{1}{2}$ and $\frac{3}{4}$	14	$d = 0.0614 D - 0.1857$
$1\frac{1}{8}$, $1\frac{1}{2}$ and 2	$11\frac{1}{2}$	$d = 0.0607 D - 0.2152$
$2\frac{1}{2}$ to 10	8	$d = 0.0587 D - 0.2875$

"The number of screw-threads per inch for the several sizes of tubes is here accepted from customary usage."

To a committee of the American Society of Mechanical Engineers, composed of Messrs. Frederick Grinnell, of the Providence Steam and Gas-Pipe Co.; George Schuhmann, of the Reading Iron-Works; William J. Baldwin, of New York; B. H. Warren, of the Hancock Inspector Co., and George M. Bond, of the Pratt & Whitney Co., in conjunction with a committee of the wrought-iron pipe manufacturers, composed of Messrs. L. W. Shallcross, of Morris, Tasker & Co.; J. H. Flagler, of the National Tube-Works Co.; L. J. Piers, of the Allison Manufacturing Co., and James H. Murdock, of Pittsburg, is due the credit of the adoption of this measure.

At a joint meeting of the committees of the wrought-iron pipe manufacturers, the iron fitting manufacturers, the brass fitting manufacturers, and the committee of the American Society of Mechanical Engineers, held at the

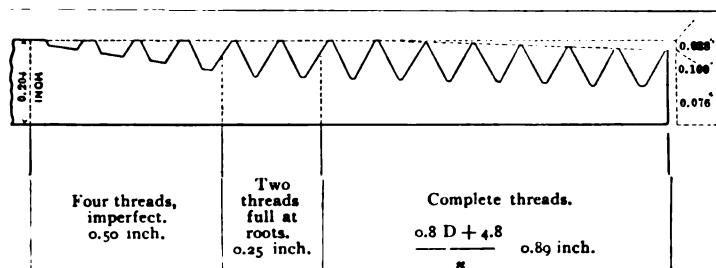


FIG. 1.

Thread of $2\frac{1}{2}$ -inch tube. Enlarged double full size.

about $2\frac{1}{2}$ inches internal diameter, and $2\frac{3}{8}$ inches actual external diameter.

"The thread for pipes employed has an angle of 60° ; it is slightly rounded off both at the top and at the bottom, so that the height or depth of the thread, instead of being exactly equal to the pitch, is only four-fifths of the pitch,

or equal to $0.8 \times \frac{1}{n}$, if n be the number of threads per inch. For the length of tube-end throughout which the screw-thread continues perfect, the empirical formula used

is $(0.8 D + 4.8) \times \frac{1}{n}$, where D is the actual external diam-

eter of the tube throughout its parallel length, and is expressed in inches. Further back, beyond the perfect threads, come two having the same taper at the bottom, but imperfect at the top. The remaining imperfect portion of the screw-thread, furthest back from the extremity of the tube, is not essential in any way to this system of joint; and its imperfection is simply incidental to the process of cutting the thread at a single operation. From the foregoing it follows that, at the very extremity of the tube, the diam-

eter at the bottom of the thread $= D - \left[\frac{2 \times (0.8 D + 4.8)}{32 n} \right]$

$+ \frac{2 \times 0.8}{n} = D - (0.05 D + 1.9) \times \frac{1}{n}$. The thickness

of iron below the bottom of the thread, at the tube extremity, is empirically taken to be $= 0.0175 D + 0.025$. Hence the actual internal diameter d of any tube is found to be, in inches,

$d = D - (0.05 D + 1.9) \times \frac{1}{n} - 2 \times (0.0175 D + 0.025)$

or $d = 0.965 D - 0.05 \frac{D}{n} - \frac{1.9}{n} - 0.05$.

"For the various sizes of tubes, ranging from one-eighth of an inch to ten inches nominal internal diameter, with

Fifth Avenue Hotel on October 25, it was understood that the iron and brass fitting manufacturers were willing to adopt any common standard adopted by the wrought-iron pipe makers. We hope that at the meeting of the cast-iron and brass fitting associations to be held in Pittsburg, December 7 and 8, that the matter will be unanimously ratified, as in any event it will be a matter of necessity on their part after the pipe manufacturers have made the change.

SOME RECENT PLUMBING-WORK IN PHILADELPHIA.

(From an Occasional Correspondent.)

THE plumbing in the residence of Dr. Weir Mitchell, in Philadelphia (1524 Walnut Street), was reconstructed this summer by Mr. John Worthington, master plumber, from plans of Colonel George E. Waring, Jr., and under the immediate direction of his assistant, Mr. George F. Brown.

The following details may interest the readers of THE SANITARY ENGINEER and CONSTRUCTION RECORD. The pipes are exposed or easily accessible, and there is a general absence of wood-work in bath-rooms and about the water-closets.

In the principal bath-room (on the second floor) is an enameled-iron bath cased with smooth and perfectly plain white marble. It has nickel-plated fittings, including a standing overflow. Its supply-pipe connections are concealed by the casing, but are accessible by removing a single screw on which is hung a thin marble slab covering a large opening in the casing at the foot. The waste-pipe has a mechanical trap, said to be non-syphoning, and therefore not ventilated. This is accessible through a trap-door in the floor of a small closet-room on the other side of the partition.

At the foot of the bath is the only wash-basin in the house. It is of plain white porcelain, of the type having a straight back with standing overflow. The space beneath

it is entirely open above the white marble slab. The waste-pipe and its trap (same kind as the bath) being fully exposed are nickel-plated.

Beyond the basin, in the corner of the room, is a water-closet, set on a plain white marble slab, with sides and back of the same. The only wood-work about it—or in this

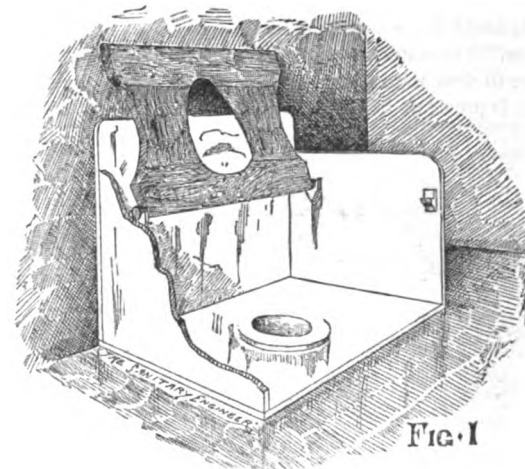


FIG. 1

bath-room at all—is the seat, which is supported on nickel-plated rests bolted to the slabs on either side, as shown in Fig. 1. It may be turned back, allowing the closet to be used as a slop-sink, or lifted off entirely.

The tank for this closet (giving a flush of $2\frac{1}{2}$ gallons) is on the other side of the partition, in the small water-closet room above referred to, and supplies both closets. The valve-chain is brought into the bath-room and out to

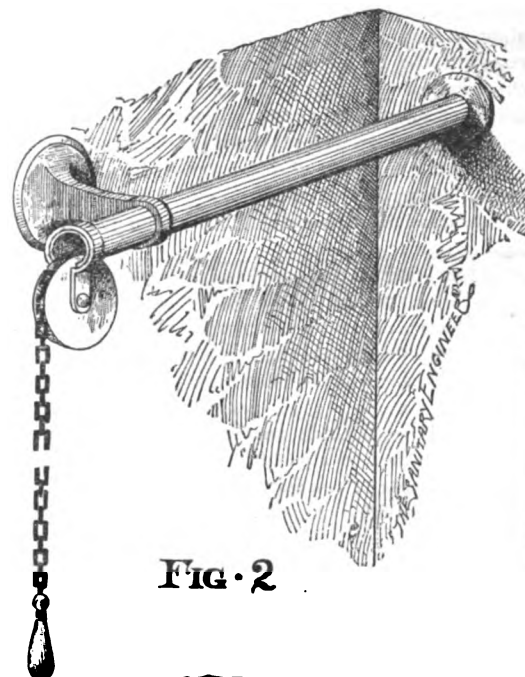


FIG. 2

the front of the closet, through a $\frac{1}{2}$ -inch nickel-plated pipe, to the end of which is attached a pulley-wheel over which the chain passes, as shown in Fig. 2. The pipe is supported from the wall near the end, as shown. In another place a flushing-cistern is placed in an adjacent

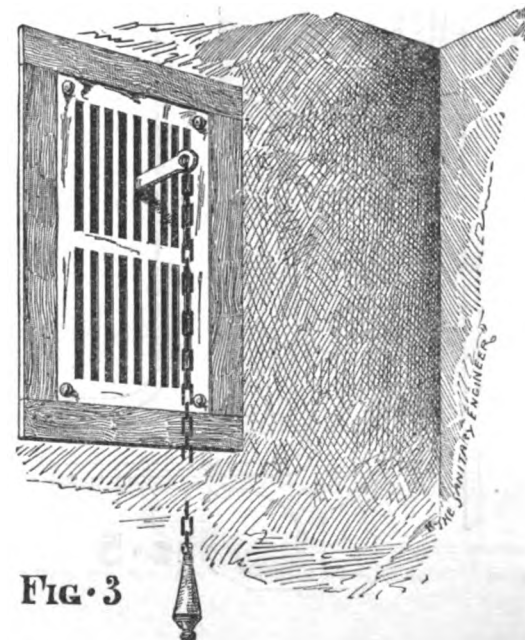
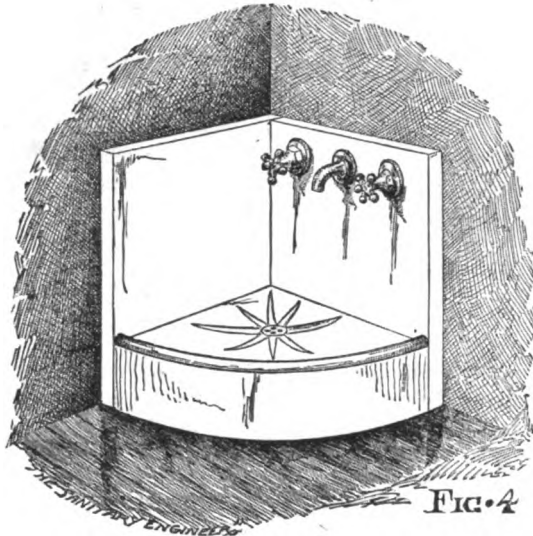


FIG. 3

room which is not heated. There the device represented in Fig. 3 is used to let warm air into the case surrounding the cistern to prevent the water from freezing. A nickel-plated grating (10x18 inches) is screwed to the casing of the opening to the cistern in the wall at the right of the closet. The lever controlling the discharge-plug comes out between the bars as shown.

As noted in the beginning, there are no slop-sinks in the house. The water-closets are used for that purpose. A place to draw water, however, similar to the ordinary slop-sink, is provided in each chamber floor in a corner of the



back hall (adjacent to the bath-room and water-closet, above referred to, so that its trap is accessible through the same opening), as shown in Fig. 4. A white marble slab, slightly depressed in the centre about a small strainer (through which a small overflow may run off, but not large enough to receive water poured rapidly from a pail), is set about five inches above the floor, with plain slabs about twenty inches high on either side. Hot and cold water are drawn through one outlet between the valves.

The kitchen-sink has beneath it, instead of a grease-trap, a 12-gallon cylindrical receptacle, with gradually contracted outlet at the bottom. This is closed by a plug connected with a rod which terminates in a knob above the depressed centre of the strainer outlet of the sink. When the receptacle gets full, it is necessary to raise the plug; then the whole accumulated volume of sewage passes out with a rush, flushing the pipe. It is designed thus to get rid of the grease. If any remains on the sides of the receptacle they may be cleaned off after lifting out the strainer. The same contrivance on a smaller scale (two gallons) is placed under the pantry-sink. At some distance below the container (as it may be called) is a common running trap, with-out ventilation.

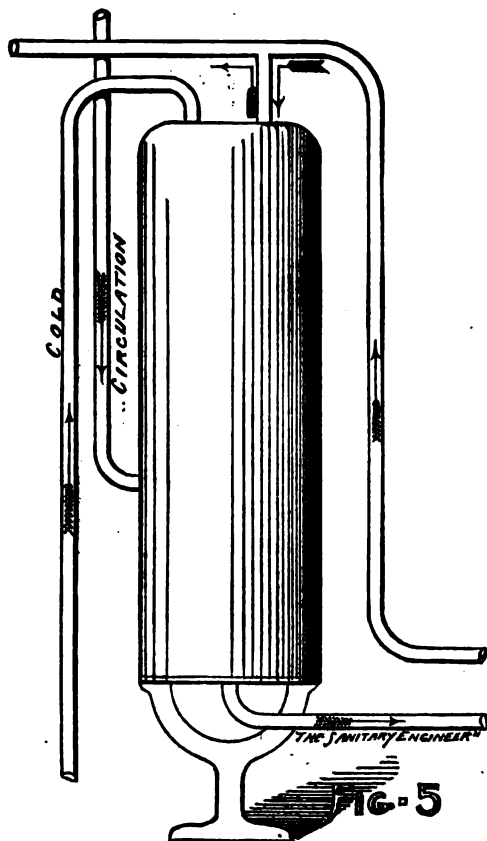
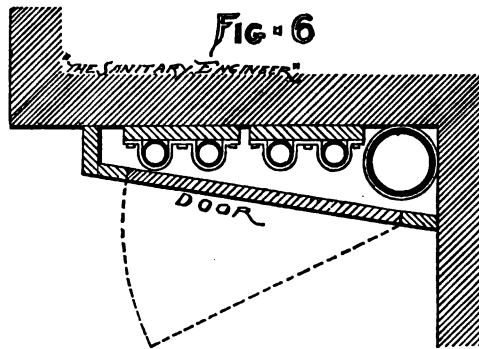


Figure 5 shows the new arrangement of pipes connecting with the old kitchen boiler or hot-water reservoir. The return-pipe from the water-back in the range passes directly to the fixtures with a branch into the boiler at the top, and the circulation-pipe enters at the side opening.

The vertical pipes between stories are placed in a shallow, closet-like compartment in the corner of the back hall as shown in Fig. 6. Although in quite a narrow passage it is not at all in the way.



Rain-leaders are collected separately and united with the house-drain just above the running-trap (5-inch iron) in the back yard. Beyond the trap the house-sewer is 6-inch terracotta. The fresh-air inlet (4-inch) is carried up about ten feet beside the rear entrance-way, and has a wire-basket protector. The soil-pipe (5-inch) is increased to 6-inch below the roof, and is left entirely open at the end.

EXAMINATION QUESTIONS IN A PLUMBING COURSE.

THE fifth winter course of instruction in plumbers' work at the Polytechnic Young Men's Christian Institute, London, was resumed last month under the direction of Messrs. J. W. Clark and G. Taylor. The examinations include questions founded on such subjects as the following:

1. The properties and qualities of lead and tin; of white and red lead, lead oxides, cements, etc. The special uses to which any of these substances are applied in plumbing.
2. Solders and soldering. Composition and use of the various solders. Fluxes and soldering fluids. Theory and practice of soldering. Soldering-bits. Blow-pipe work. Brazing. Autogenous soldering.
3. The tools used in plumbers' work; their forms, uses, etc.
4. Geometry as applied to plumbing. Cutting out sheet-lead to fit various positions. Setting out work and making working drawings.
5. Roofing. Rain-drainage of houses. External plumbers' work.
6. Varieties of traps, D-traps, bell-traps, etc.; their use and abuse. Soil-pipes. Connection with the drain. Connection of drain with sewer. Disconnection, trapping, and ventilation of soil-pipes and drains. Sizes of pipes. Amount of fall required. Objections to brick drains. Drain-pipes of iron. Proper materials and constructions for drains. Joints for drain-pipes, and methods of laying the same.
7. Water-supply for houses. Dangers arising from insufficient and impure supply. House-cisterns, their construction, position, management, and care. Water-meters. Ball and other cocks and valves. Brass-work used by plumbers.
8. Water-closets and their fittings. Service-boxes. Waste-water preventers. Baths, lavatories, sinks, urinals.

In the honors examination more difficult questions will be set in the above subjects, and, in addition, a knowledge will be required of:

1. The action upon lead, zinc, and tin, of air, of different qualities of water, of the commoner acids, of sewage-gases, etc.
2. Manufacture of the metals into the various forms in which they are used in plumbing. Cast sheet-lead. Milled sheet-lead. Casting lead tubes. Coating tubes internally.
3. Sanitary arrangements in dwelling-houses (town and country) and other buildings. Common defects. Methods of testing drains, soil-pipes, etc. Principal points to be attended to in (a) fitting new houses, (b) remedying existing defects.
4. Hydrostatics and hydrodynamics as applied to plumbers' work. Rams, turbines, water-wheels, pumps, and gearing. Water-hammer, etc.
5. Water-supply to houses. Arrangements for collecting and storing rain-water. Connection between disease and water. Dangers of water from surface-wells. Filters. Dangers from connection between cesspools and water-supply.
6. Principles of hot-water circulation. Heating by hot water, high and low pressure, and by steam. Tools used by hot-water engineers.
7. Disinfectants and deodorants. How they act. Methods of applying them.
8. The various systems for the disposal of dwelling-house and town sewage.

9. Gas-fitting. Measurement of pressure of gas in a main or pipe. Forms of burners. Gas-meters, wet and dry.

PROGRESS OF PLUMBERS' REGISTRATION IN ENGLAND.

ABOUT a fortnight ago a report was received by the General Council of the Worshipful Company of Plumbers, of London, from the committee appointed in accordance with resolutions adopted last winter, providing for a system of plumbers' registration, which has been extended to include both London and the "Provinces." We here report the greater part of the report of the meeting from *London Building News*.

The report of the committee was read by Mr. George Shaw, who reported that in proceeding with the scheme of registration he had discussed with the committee conditions which should be considered sufficient to entitle plumbers to enrollment upon the company's register, and it had finally been decided that the present standing of master plumbers and journeymen, provided they were able to satisfy the committee of being otherwise qualified, should be deemed a sufficient qualification. It was further decided that journeymen able to produce evidence of apprenticeship to plumbers, coupled with satisfactory testimonials from employers, should be eligible for enrollment. In the next place it was decided that all information placed before the registering committee by applicants should be treated as confidential communications, made in good faith, for the sole purpose of satisfying the Plumbers' Company of the qualifications of the applicants; and further, that all inquiries necessary to test the correctness of applicants' statements or otherwise should be conducted with due circumspection and regard for the personal interests of the parties. The applications for registration had come in from a very wide area, embracing almost every important district of the United Kingdom. With regard to the applications from distant places it had been agreed that in cases where it is inconvenient or impracticable for the applicants passed by the committee to attend at Guild Hall to receive the company's certificate, they should be issued in the applicants' districts under due regulations and adequate precautions. The number of each class of applications dealt with by the committee up to that day was: London masters, 149; provincial masters, 123; London journeymen, 280; provincial journeymen, 150; total applications dealt with 702, and several hundred applications had yet to be considered. Nine plumbers on the committee were appointed to examine practically those applicants who were unable otherwise to satisfy the committee of their qualifications, and special facilities were obtained from the City and Guilds' Institute for carrying out these examinations. The endeavor had been to make these examinations of as practical a character as possible—not so severe as to prevent men of even moderate skill and knowledge from obtaining the company's certificate, while, at the same time, being such as every man should, in Mr. Shaw's opinion, be able to pass to entitle him to work practically as a plumber in houses. These examinations might hereafter be changed as technical instruction extended among the coming generations of plumbers. Messrs. J. C. Ashdown, A. Common, R. A. Nurse, and J. Smith, had been appointed as additional members of the committee to assist in the examination. A separate register will be kept of those plumbers who, in the opinion of the examination committee, are not possessed of the necessary qualifications sufficient to entitle them to immediate registration, but may be able to qualify themselves later after they have acquired further experience.

The report of the committee was adopted, and in recognition of services done in promoting the registration system, a certificate of registration, together with an illuminated address on vellum, was presented to Mr. Shaw.

Correspondence.

WATER-SUPPLY OF MOBILE, ALA.

NEW YORK, November 15, 1886.

SIR: In your issue of November 13 there appears an item relating to Mobile, Ala., which is incorrect.

Mr. Louis Stein has *not* made a proposition to the "Council" of Mobile—which, by the way, is known as a "Board of Commissioners" of the Port of Mobile—nor can he interfere in any manner with the chartered rights of the Bienville Water-Supply Company.

We will thank you to make this correction, and we remain, yours truly,
 SAMUEL R. BULLOCK & CO.,
 Contractors for the Bienville Water-Supply Company, the
 Port of Mobile.

WHO MAKES WATER-PROOF PAINT ?

NEW YORK, October 26, 1886.

SIR : I would like to know who makes water-proof paint suitable for application to cellar walls of stone masonry to make them damp-proof and water-proof ? I find nothing of the kind advertised in your columns. C. E.
 [Referred to our readers.]

BOOKS ON PLANNING AND CONSTRUCTION OF HOSPITALS.

NEW YORK, November 3, 1886.

SIR : Please inform me through your columns what books on the construction and planning of hospitals I had better consult in order to obtain fundamental ideas valuable to an architect, and you will greatly oblige,
 SUBSCRIBER.

[The best books for study in relation to hospital construction are as follows :

1. Johns Hopkins Hospital. Hospital plans. Five essays by Drs. Billings, Folsom, Jones, Morris, and Smith. 8vo. New York: William Wood & Co. 1875.
2. Das städtische allgemeine Kraulcenhaus un Friedrich-shain zu Berlin. von Gropius & Schmeiden. Fol. Berlin. 1876.
3. Galton, D. Report Descriptive of the Herbert Hospital at Woolwich. 4to. London. 1865.
4. Nightingale, F. Notes on Hospitals. 3d ed. 4to. London. 1863.
5. Husson A. Étude sur les hôpitaux. 4to. Paris. 1862.
6. Mouat & Snell. Hospital Construction and Management. 4to. London. 1883-84.
7. Billings. Ventilation and Heating. New York. 8vo. Published by THE SANITARY ENGINEER. 1884.]

FINISH FOR HOSPITAL WALLS AND MATERIAL ON WALLS OF THE TROCADERO.

BOSTON, MASS., November 8, 1886.

SIR : In referring to THE SANITARY ENGINEER AND CONSTRUCTION RECORD of the 6th inst., in reference to finish for hospital walls, I would like to ask if a good soapstone finish applied to the first coat of plastering is not as good, if not preferable, to sand finish with three coats of paint ?

I see in the description of the Palace of the Trocadero it is said that the ceilings and walls are covered with canvas ; I would simply state that the material used was spun silk, with a painted design on it. Respectfully,
 Y. N. S.

[Soapstone finish has not yet been subjected to the test of experience long enough to speak positively about its merits, but it is certainly not so good as the paint finish. On the other hand, it is much less costly, and may itself be painted on.]

HOT WATER AND STEAM HEAT COMPARED.

BOSTON, November 10, 1886.

SIR : I have read with much interest the able work on "The Principles of Ventilation and Heating," by John S. Billings, M. D., LL.D., Surgeon U. S. Army, and wish to correct the impression one might get from reading his remarks on "Hot-Water Heating." Chapter 4, page 44, he says : "It is only where the first cost of the apparatus is a minor consideration, and where the cellars can be almost entirely given up to the heating-apparatus, that hot-water is used."

In reference to the above remarks, I fail to see the necessity of almost entirely giving up the cellar to a hot-water apparatus, any more than for steam. I have constructed many low-pressure steam-heating jobs, and within the last seven years nearly one hundred and fifty jobs in hot water, both in this country and in Canada, and I know of no case wherein a low-pressure hot-water job constructed upon the English system took up or occupied any more space than a steam-apparatus or furnace. Second, he says, page 48 : "The cases in which hot-water apparatus is used in such buildings (alluding to public buildings) are comparatively few, this form of heating in this country being for the most part confined to green-houses." Also, page 49, he says : "In addition to the important one that the plant for a steam-heating apparatus is cheaper than a hot-water one, it has come to pass that there are but three or four firms in this country which recommend hot-water apparatus under any circumstances." Now, these remarks

may have answered the purpose when they were written, and it may be in this country that hot-water apparatus is not extensively used, and is confined for the most part to green-houses ; but as to steam-apparatus being cheaper, my experience has been, that a hot-water apparatus can be set up in a house or other buildings as cheaply as steam—i. e., all things being equal, material, workmanship, and general durability of the apparatus.

Page 51, Dr. Billings says in reference to Hood's work : "The principal objection to this book as a practical guide for work in this country is, that it has too exclusive reference to the demands of the English climate, and that a hot-water apparatus constructed in accordance with its formula and set up in New England would be found to give an insufficient supply of heat."

While the above is to a certain extent true, I consider Hood's work a thorough and practical treatise upon the subject of hot-water heating, and if an apparatus is set up according to his instruction, it will be found to work satisfactorily, except that the radiating surface will have to be increased over his formulas for this climate heating. This has been done in Canada, where they allow six to eight feet of one-inch pipe as radiating surface (according to exposure) to every 100 cubic feet of air, and with satisfactory results in their extreme cold climate.

It has generally been put forth or supposed that a hot-water apparatus costs more to construct than a steam-apparatus, and a great many persons have been somewhat reluctant about adopting it on account of the supposed expense. This is not so. I can now say that after an experience of ten years in fitting up this class of apparatus, hot water is not any more expensive to adopt than steam, and it certainly is not so dangerous, is more economical, and requires less care and repairs than any other system of heating now before the public, and is recommended by the best authorities.

Among the large public buildings of Canada heated by hot-water, I will mention a few, all of which are giving the best satisfaction, and some of them in operation for years : Grey Nunnery, McGill College, Art Gallery, Medical School, St. Peter's Church, Canadian Express Co., all in Montreal ; Geological Museum, Ottawa ; Custom-House, Quebec ; Palace of Justice, River du Loup ; Marine Hospital, St. John, N. B. ; Saint Mary's Cathedral, Halifax, N. S. All these are model jobs, and can be pointed to as giving the best of satisfaction, and should correct the general impression that you cannot heat a large building by the hot-water system.

Respectfully submitted.

Yours truly, JOHN A. FISH.

N. B.—Please add to the list of the above buildings, as warmed by hot water : The Intercolonial Railway Station, Saint John, N. B. ; also the Intercolonial Railway General Offices at Moncton, N. B., all giving good satisfaction, and all very large buildings. J. A. F.

[As the matter in Dr. Billings' book originally appeared in our pages several years ago, we have referred this letter to him. His reply will be found below.—ED.]

WASHINGTON, D. C., November 16, 1886.

SIR : I have read the criticism of Mr. Fish upon my remarks upon hot-water heating written six years ago for the columns of THE SANITARY ENGINEER. My statement that the plant for hot-water apparatus is more costly than for steam-apparatus was based upon practical experience and upon the examination of bids from different contractors for heating the same buildings with steam or with hot water. If it is now otherwise I am glad, for in many cases, and especially for hospitals and for private houses, I prefer hot water to steam—putting aside the question of cost. That a hot-water apparatus requires more space than a steam-apparatus is certain, if each is to do the same work, for the temperature of the hot-water radiators will be lower than those for steam. As my criticism on Mr. Hood's book has been referred to, it may be well to give the main points upon which it was based :

"Mr. Hood bases all his calculations as to the amount of radiating surface required upon the assumption that these radiators should be constructed of cast-iron pipe four inches in diameter. Those who have had most experience, and attained the greatest success, with the hot-water apparatus in this country prefer 3-inch pipe, and use much more of it than Hood's formula calls for." "Mr. Hood's calculations as to the amount of air to be warmed are based on a supply of from three and a half to five cubic feet per minute for each person in habitable rooms, which is hardly one-tenth of the amount required for the preservation of health and comfort."

When the proper amount of air-supply is given, the difference in size, in space occupied, and in cost between steam and hot-water apparatus is much more than when heating only is considered in the plant. I have pointed out that one great reason why steam has been generally preferred to hot water for heating in this country has been that the general use of steam for motive power has made a large number of workmen familiar with the fittings required for its use, and that in all parts of the country such fittings and men who can use them are easily obtained, so that repairs and changes are easily made. This is not the case with hot-water apparatus. There are comparatively few who construct or repair it. It is much easier to "scamp" a steam-heating job than a hot-water one.

If Mr. Fish has come from Canada prepared to change the situation, and to furnish and set up hot-water apparatus which shall be connected with sufficient fresh-air supply, at the same cost as for a steam-apparatus, which will do the same work, I am extremely glad to hear it, and hope that he will have abundant opportunity to compete with the steam-heating firms for heating contracts for large public buildings, which are advertised for every month in the year. J. S. BILLINGS.

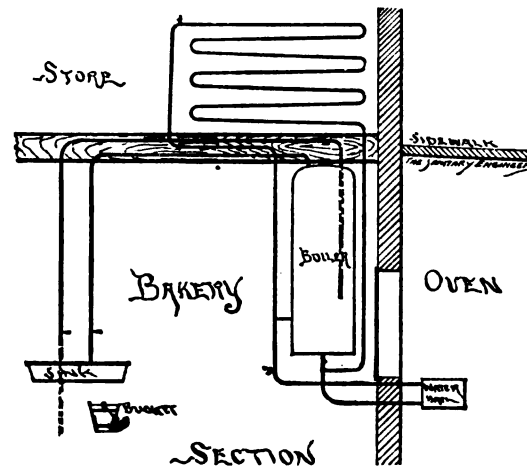
WARMING A STORE OVER A BAKE-OVEN.

BALTIMORE, November 10, 1886.

SIR : How will a water-back do to go into a bake-oven ? Will it give hot water sufficient to heat a coil of pipe in a store-room over a bakery ? The oven is fed with coal, and is a very large one. The style of water-back I will put in will be twelve inches square, and four inches through oven. Respectfully,
 "R."

[Anything of this kind must be an experiment, the results of which may be provoking in one direction or another.

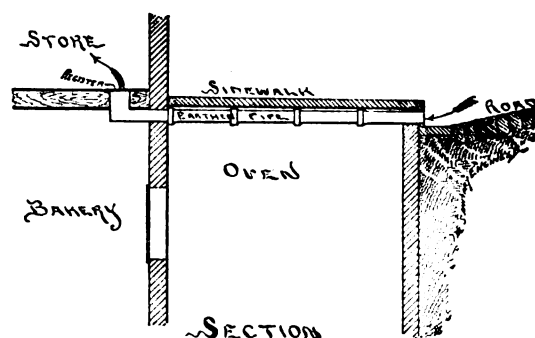
There is nothing to prevent a water-back from being warmed in an oven, but the question of the size of coil that would be suitable is uncertain. If you try it, be sure and make it good and large, or otherwise the chance of making steam in it is pretty certain. In summer time, however, we do not see what you can do. If the water-back is suffi-



cient for both boiler and coil in the winter, and you shut off the coil in the summer, you will probably make steam in the boiler. It may also follow that you will not be able to bake properly if you introduce a water-back into the oven. This will be purely a matter of experiment also.]

The same writer asks at a later date :

"What I want to know is how can a room be heated from a bake-oven, when the oven is under the pavement ? My own idea is to put an earthen pipe over the top of oven, with a draught at curb, and put register in store. This is the position :



"Eighteen inches below the bottom of joists is the oven-top. Respectfully,
 "R."

[This plan of warming the store may be more practicable than the first, only we do not like the idea of taking

fresh air from the gutter. We would suggest an iron pipe terminating in a register in the store, but taking air from some point a few feet above the sidewalk—say close to the store-windows. This pipe might go down within the bake-house and enter the oven low down, then rise to the store, so the air would not have a tendency to go the wrong way. The effect on bread-baking is still an unknown quantity, though we are of the opinion the air-pipe would be less injurious than the water-back. The latter method also presents a means for regulating the heat in the store by closing the register. If an iron pipe is exposed to a temperature that will redden it when the fire is strong, why then an earthen pipe may be tried, but we do not think you can make it air-tight.]

WARMING A BUILDING WITH NO CELLAR WHEN THE BOILER MUST BE ON THE LEVEL OF THE MAIN FLOOR.

ALBUQUERQUE, N. M., November 11, 1886.

SIR: I have a job of steam-heating, "low-pressure," to do in a new court-house, which is now being built. It is three stories high by 100x75. There is no cellar, and so have to set boiler on first floor, which also has to be heated, and is divided into eight offices, with a 10-foot hall running the entire length of building. Now what I want to know is, would it be best to keep radiators near ceiling, or bring them down to floor and run separate returns to a steam-trap? And how much difference would there be in loss of heat by the last plan?

Any information you can give me relating to this subject will be thankfully received by an old subscriber South-west.

Yours sincerely, R. W. SYMONS.

P. S.—It is impossible to dig a cellar here on account of water being struck at a few feet.

[It is better to run separate return-pipes for the lower floor and put the radiators on the floor, using a return-steam trap to put the water so received into the boiler. The loss of heat is comparatively small, and is equivalent, at the most, only to the surface of the extra return-pipe and trap compared with the gross surface in the remainder of the apparatus; but, presumably, as much heat as this will not be lost, as the effect of this heat must be felt within the building, for you will probably have to run the pipe within the thickness of the floor. Notch it in somewhat similar to a gas-pipe near the ends of the joists, or take advantage of the spaces between the joists if they run in a manner to be so utilized. The remainder of the apparatus had better be run on the gravity principle. Experiment will show the least pressure that the trap will work under, but, presumably, five pounds per square inch will be carried.]

DRAWING COLD WATER FROM HOT-WATER PIPE.

LIVERPOOL, October 26, 1886.

SIR: I should feel obliged if you can explain the following occurrence. The accompanying sketch is a diagram of the water-supply (hot) in a house. There are two lines of return circulation taken off the expansion-pipe. The returning ends of these lines join together, and, as one pipe, are branched into the flow-pipe to water-back (from cylinder).

When the stop-cock is open one can only draw cool water from the cylinder, although the upper part of it may be quite hot; so that it appears that the water from the bottom of the cylinder is drawn at the taps instead of from the top of cylinder. Upon closing the stop-cock hot water only is drawn at the same taps. What I wish to know is, by virtue of what law does the flow of the water reverse itself when the stop-cock is opened and shut?

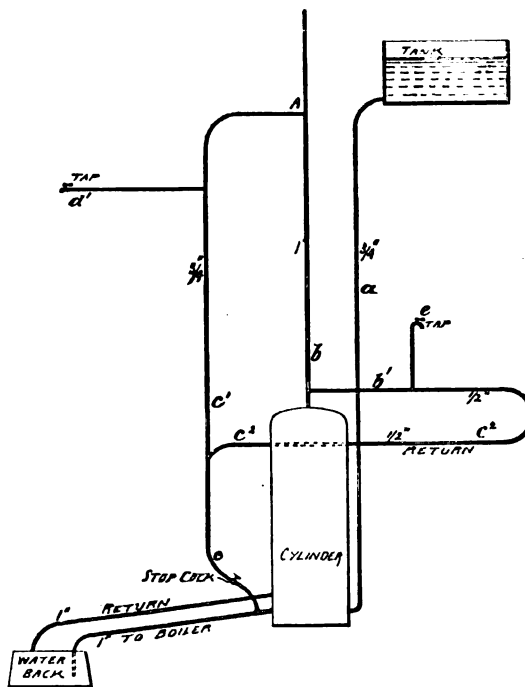
The water-level in tank will be about thirty-five feet above the top of water-back.

The point A on expansion-pipe will be about three feet six inches below water-level in tank. Cylinder holds fifty English gallons. Yours truly, A PLUMBER.

[The fact that water will flow most readily in the direction of least resistance seems to be the solution of this question. The water flows from the tank downwards through the pipe *a*, and enters the boiler at the bottom. Should the stop-cock be closed, the water to leave the boiler (cylinder) and go to either faucet must go by the pipes *b* and *b'*, and hence only hot water is drawn. Should the cock, however, be opened, the circuit by the pipe *a* through the bottom of the cylinder, and thence to the pipe *c*, *c'*, and *c''* are presumably much the shorter than by the pipe *b* and *b'*; hence the flow of cold water at the faucets.

If your pipes throughout were of large diameter, excepting the return-pipes, this probably would not occur, but they would have to be of sufficient size to supply the warm water by circulation in the proper direction. Several possible contributory causes may be given in addition to those caused by friction: (1) There may be partial obstruction caused by solder at a joint. (2) If the loss of

head within the pipes when drawing freely at a faucet is sufficient to lower the water below the point A, then no hot water can be expected at the faucet *d*, though it might still run at the faucet *e*. If it does not run warm at the faucet *e* when drawing slowly, then our opinion is a partial stoppage will be found between the cylinder and the branch *b'*. If the stoppage exists, remove it, and then "choke



down" the stop-cock until it is only sufficiently open to maintain the circulation of the water at the temperature required. This will hold back on the flow of the water by the return-pipe *c*, but if this is not sufficient put a swinging or easily-worked check-valve in near the stop-valve.]

THE AMERICAN SOCIETY OF CIVIL ENGINEERS.

THE meeting on Wednesday evening last was devoted to the paper on "Irrigation," as announced to be read by Mr. E. B. Dorsey. It was a very full presentation of the subject on its economic sides, as studied by the author in the United States and South America, Italy, Spain, and India. Mr. Dorsey gave figures to show the great increase of values of land to which irrigation has been applied; a brief description of methods, particularly of measurement, and a discussion of the legal questions now arising in the West concerning riparian rights and rights of appropriation. Under this latter head he presented an abstract of an opinion recently obtained from a leading legal firm in the West, showing that in Idaho and some other States and Territories the rights of riparian owners have been virtually abolished by State and Territorial statutes. The paper excited much interest, and caused a lively discussion on this question of riparian rights, and it was moved and carried that the topic be made the subject of the discussion at the first meeting in January.

The President of the Society, Mr. Henry Flad, of St. Louis, was in the chair.

THE Burlington, Vt., Board of Aldermen have passed an ordinance providing for the inspection of plumbing.

GLASGOW seems to be doing a good business in the gas stove line. The Gas Committee of the Town Council reports that up to the last of September 3,172 stoves, etc., have been sold, and 3,492 have been hired by different parties, making a total of 6,664.

THE *Electrician* says that Messrs. Siemens and Halske have received instructions to light the Vatican by electricity.

OUR Cincinnati correspondent writes: "The Cincinnati Gas Company has in contemplation the reduction in price of gas to private consumers. The rate is now \$1.60 per thousand feet. The capital stock of the company is about \$6,000,000, and the market price of shares ranges from 180 to 185. For several years the company has been making ten-year contracts with large private consumers at reduced rates, and this policy, together with the executive ability and personal influence of the president, has prevented to a large degree the introduction of electric-lighting into general use. There is less electric-light used in Cincinnati than in any other city, relatively, with the possible exception of St. Louis. There is no doubt but that the reduction of the price of gas to \$1 would result in such an increased consumption as not to materially decrease the net earnings of the company."

Patents.

- 851,782. Water-Supply Apparatus for Tanks. Wallace H. Bate, Melrose, Mass. Filed February 1, 1886. Issued November 2, 1886.
- 851,885. Water-Closet Flushing-Valve. Francis W. Kelly, Minneapolis, Minn. Filed March 30, 1886. Issued November 2, 1886.
- 851,889. Water-Heating Apparatus. John A. Fish, St. John, New Brunswick, Can. Filed February 20, 1886. Issued November 2, 1886.
- 851,924. Valve Attachment for Hydrants. Lyman G. Keyes, Armstrong, Kan. Filed July 7, 1886. Issued November 2, 1886.
- 851,987. Manufacture of Metal Pipe. Arthur W. Lewis, Bradford, Pa. Filed July 13, 1886. Issued November 2, 1886.
- 851,984. Air-Valve for Water-Pipes. John W. Moore, Lansingburg, N. Y. Filed September 22, 1885. Issued November 2, 1886.
- 852,072. Gas-Regulator. James Slote, London, England. Filed August 19, 1886. Issued November 2, 1886.
- 851,814. Safety Water-Gauge. Robert Street, Chicago, Ill. Filed June 1, 1886. Issued November 2, 1886.
- 852,058. Faucet. William Dougherty, Philadelphia, Pa. Filed August 11, 1884. Issued November 2, 1886.
- 852,098. Air-Vent for Water-Pipes. John C. Kupferle, St. Louis, Mo. Filed December 17, 1885. Issued November 2, 1886.
- 10,778. (Reissues). Water-Meter with Revolving Piston. James A. Tilden, Hyde Park, Mass., assignor by mesne assignment to the Hersey Meter Company. Filed September 20, 1886. Reissued November 2, 1886.

A MEMBER of a shipping firm in Boston committed suicide the other day by attaching one end of a rubber tube to the gas-burner of a bath-room in Young's Hotel, placing the other end in his mouth, and then lying down until he suffocated.

A MEETING of the State Board of Health of Pennsylvania was held in Harrisburg, November 10. There were present Dr. Germer, President of the Board; Dr. Lee, Secretary; and Drs. Engleman, of Easton; Dudley, of Philadelphia; McClellan, of Pittsburg; and Rudolph Hering, C. E., of Philadelphia. Routine reports were heard and discussed, and measures looking to the abatement of nuisances in various parts of the State were taken up. Dr. Lee, the Secretary, read his annual report, showing the detailed work of the board in the first year of its operations, in investigating and checking epidemics, abating nuisances, and generally organizing a system of sanitary reform.

IN the Court of Special Sessions on Staten Island last Monday, representatives of the petroleum-oil refinery companies on the New Jersey shore of the Kill von Kull were called to plead to indictments for allowing sludge acid to flow from their several works into the Bay of New York, resulting in the destruction of oyster-beds and injury to the fishing interests. They pleaded not guilty, and promised to meet the charges at the next term in February.

The Brooklyn *Union* of the 11th inst. says that an action for damages has just been brought in the Supreme Court, against a landlord of that city, because of alleged sanitary defects in one of his houses. The husband of the plaintiff died of disease alleged to be caused by the condition of the house. The plaintiff claims that the defendant represented that the house was in a tenable and healthy condition; that the sewerage was good, safely trapped, and that everything connected with the house was in accordance with rules of the Board of Health. The deceased and his family took possession and found that the representations as to the healthy condition of the house were untrue. The plumbing, as alleged, was "in a foul, disease-creating condition," there were no traps, and as a result disease-breeding gases were generated throughout the house. Mrs. Henderson claims that because of the pestilential vapors her husband was prostrated with typhoid malaria, and after five weeks' illness died leaving six children, ranging in ages from 3 to 16, dependent upon the widow. The plaintiff claims that she was damaged \$5,000.

BACK NUMBERS OF THE SANITARY ENGINEER.

MRS. J. B. HALLER, of Lima, O., writes that she has copies of THE SANITARY ENGINEER for the past three years for sale, her husband having recently died. Her address is Box 1086, Lima, O.

AMERICAN INSTITUTE OF ARCHITECTS.

A COMMITTEE of arrangements, in whose hands the management of the twentieth annual convention of the American Institute of Architects, which is to be held in this city December 1, 2, and 3, has been placed, held a meeting at the office of Mr. A. J. Bloor, one of the committee, Thursday afternoon. The session continued until too late to publish the results in this issue.

PERSONAL.

DR. JOSEPH G. RICHARDSON, Professor of Hygiene in the University of Pennsylvania, and a member of the Pennsylvania State Board of Health, died in Philadelphia November 13, of heart disease. Dr. Richardson was in his 51st year. He was a voluminous writer on hygienic subjects, being the author of several well-known works, as well as a handbook of Medical Microscopy, which is used as a textbook. As a student he was untiring, and appeared to be absorbed in the study of his two favorite subjects, hygiene and microscopy.

LEAVE of absence for one month has been granted Major Charles Smart, Surgeon, U. S. A.

A. L. ELTONHEAD, of Philadelphia, has been appointed Chief-Engineer of the American Dredging Company, with full charge of its work on the canal across the Isthmus of Panama.

MR. BAILEY DENTON has been selected as consulting engineer on the Manchester, England, sewerage and sewage disposal scheme.

LIEUTENANT-COLONEL HENRY M. ROBERT, Corps of Engineers, U. S. A., has been ordered from Philadelphia to inspect Fort Delaware, the fort and mortar battery opposite Fort Delaware and the battery at Finn's Point, New Jersey.

THE following changes in the station of engineer officers have been ordered: Capt. D. C. Kingman will be relieved from duty as engineer officer, Department of the Platte, by the commanding general of that department, and will proceed at once to take station at New Orleans, relieving Major Charles W. Raymond of his present duties and reporting by letter to the President of the Mississippi River Commission. Major Raymond, upon being relieved, will repair to and take station in New York City, reporting for duty to the chief of engineers for duty in his office.

AT the meeting of the Cleveland Engineers' Club on November 9, Mr. J. F. Holloway delivered an eulogy on the late Colonel Charles Whittlesey, honorary member of the club, who died in Cleveland on the 18th of October.

AMONG those on whom the degree of LL. D. was conferred at the recent Harvard Anniversary were Dr. J. S. Billings, Surgeon U. S. A., who has this degree from Edinburgh; Professor J. W. Powell, of the Geological Survey; and Professor J. S. Baird, Secretary of the Smithsonian Institution.

NEW CATALOGUES.

WE have received the second edition of "Fire-Side and Kitchen, Ancient and Modern," issued by the Barstow Stove Company, 230 Water Street, New York. The artistic and historical interest in this publication make it well worth perusal and preservation. We are informed a copy will be sent free to any architect or person building who requests it.

ANNOUNCEMENT.

The publication of the sixth revised edition of the U. S. Pharmacopoeia (1880), containing as it does much more strict requirements for the purity and strength of pharmaceutical preparations, has been followed in some States of the Union by the enactment of laws against the adulteration of drugs, which laws make the Pharmacopoeia the official standard.

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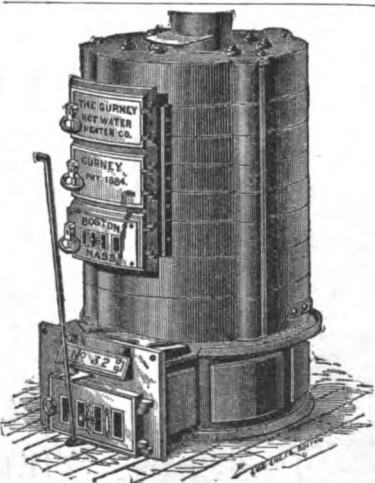
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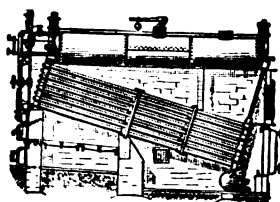
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am, Architects.

Military Hospital for Hot Climate, designed by Maj.
Gen. Sir Andrew Clarke, R. E., A. I. C. E., and E.
Ingram Bell, A. R. I. B. A., Architects.

Church at Auvers, Seine-et-Oise, France.

Private Residence at Brookline, Mass., Geo. E. Harney,
Architect.

Brooklyn Life Ins. Co.'s Building, F. Charles Merry,
Architect.

Hotel Lallemand, Bourges, France.

Union Club, Chicago, Cobb & Frost, Architects.

Lodge at County Place of Chas. J. Osborn, Mamaroneck,
McKim, Mead & White, Architects, and Lodge
at Private Residence, at North Eastern, Mass., H. H.
Richardson, Architect.

Cancer Hospital, New York, Charles C. Haight, Archi-
tect.

Entrances to Private Residence in Boston, Cabot &
Chandler, Architects, and at Albany, H. H. Rich-
ardson, Architect.

Residence of W. L. Skidmore, New York, R. H. Rob-
ertson, Architect.

There are also illustrations of several moderate cost
dwellings, by Architects W. A. Bates, Eames & Young,
and T. M. Clark.

Water-Supply of New York City.—Continuation of
the history of the progress of the work of the great Cro-
ton Aqueduct (with illustration, details of Gate House,
etc.)

Waste of Water in Liverpool.—Abstract from the
report of Mr. Parry on the measures to further restrict
the waste of water in Liverpool.

Water-Supply and Sewerage of Venice.—By C. H.
Blackall. With illustrations and descriptions.

Recent Water-Works Construction.—Wellesley,
Mass., Water-Works.

Illustrated Description of Plumbing, Heating, Light-
ing and Ventilating Features.—Included in which
are Plumbing and Tank Service in the Delaware Apart-
ment House; Plumbing in Y. M. C. A. Building, Brook-
lyn, illustrations and descriptions; Plumbing Regula-
tions in Sacramento, Cal.; Pumping and Water-Supply
in the new Cotton Exchange Building.

Vitality of Cholera Bacillus and the means for its
destruction.—Being a review of the reported experi-
ments of Drs. Nicati and Reitsch.

Report of a series of trials of a Warm-Blast apparatus
for transferring a part of the heat of escaping fire gases
to the furnace. By J. C. Howland, Boston, Mass.

Lighting and Ventilating Ordinary Apartments
by Gas.—By William Suggs. Being portion of a paper
read at the meeting of the Gas Institute.

Steam-Heating Apparatus in Mutual Life Ins.
Co.'s Building.—Description and illustrations.

Specifications for Vitriolized Stoneware Pipe Sewer.
—By E. Kuichling.

Inventions Exhibition.—Illustrated descriptions of
the various articles exhibited of probable interest to
readers of THE SANITARY ENGINEER.

Bids for Section 1 of the New Croton Aqueduct.—
Table giving engineer's estimates of quantities, price
per cubic foot, per cubic yard, total of bid of each
contractor on each item of specification, and grand total
of each contractor for the whole work.

Hospital at National Soldiers' Home, Hampton,
Va.—Fully illustrated.

Housing of the Working Classes in England and
Wales.—Full abstract from the report of the Royal
Commission.

Illustrations and Description of the details of
Steam and Ventilating Apparatus used on the Continent
of Europe.

Some Practical Results in Heating and Ventilating
as Observed in the Mass. Inst. of Technology.—By S.
H. Woodbridge, A. M.

Garbage and Refuse Cremator.—Section and De-
scription.

Takhtsingri Hospital.—Illustration and Description.

Royal Monnaie Theatre, Brussels.—Steam-heating
and mechanical ventilation of.

Grant Monument.—Correspondence and suggestions
over the proposition to secure a design for the Grant
Monument.

Comment on provisions of American Institute of
Architects' bill to provide for the erection of Govern-
ment buildings.

Moses Taylor Hospital.—Illustration and descrip-
tion.

Repairs to the Cooper Institute.—Elaborately illus-
trated, and a valuable article to architects, builders, and
civil engineers; this being the first building in which
iron beams were used, showing the faults in the original
plan and what has been done to remedy them.

Natural vs. Artificial Cements.—Communications
on this subject, with table comprising tests of cements
and brick. By F. Collingwood, and correspondence
from others.

Circular vs. Rectangular Wards.—Controversy on
this subject between H. Saxon Snell and Henry C. Bur-
dett. Of use to architects and those interested in hos-
pital construction.

Standard Pipe and Pipe-Threads.—Paper read be-
fore the American Society of Mechanical Engineers.

Detail of Plumbing in Manhattan and Merchants'
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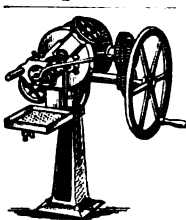
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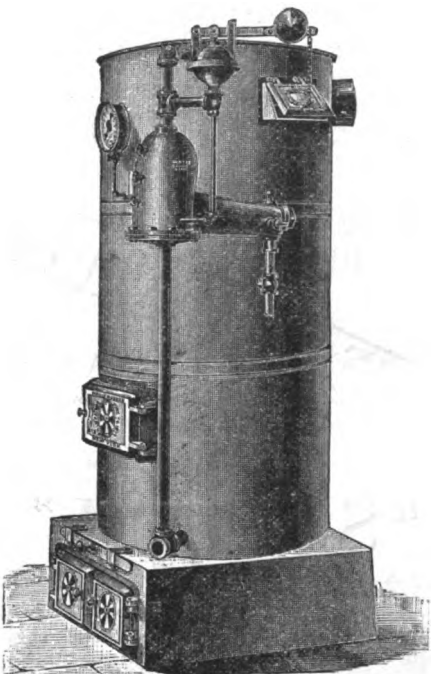
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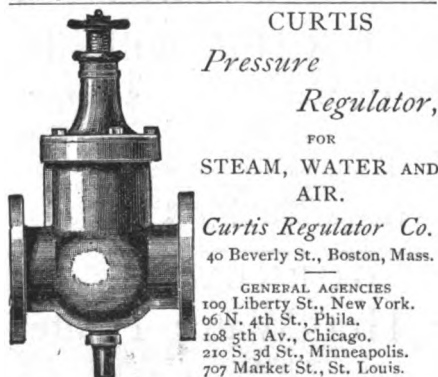


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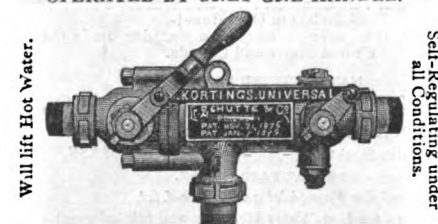
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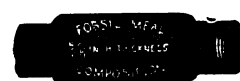
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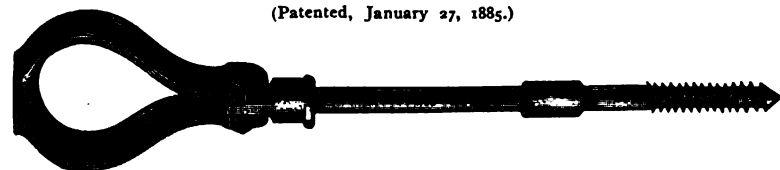
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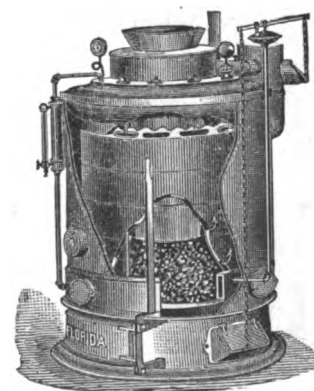
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THE BIRMINGHAM COMPRESSED-AIR SCHEME.

A PAPER read before the British Association gives a full account of this important enterprise, which contemplates supplying compressed air for power. As the scheme has not been tried the estimates of cost and efficiency have not been demonstrated, and in the discussion which followed many of the speakers thought the latter had been overestimated; this, under the most favorable conditions, being taken at eighty-five per cent.—that is to say, that eighty-five per cent. is the ratio between the indicated horse-power at the consumers' engines and that at the main engines. To obtain this, however, the air is reheated to 320° Fah. at the place where it is consumed. In case it be *not* so heated and is cut off at three-quarters stroke the efficiency is but forty-one per cent. If this be compared with the results obtained by the New York Steam-Heating Company, which reports a loss of about two pounds, or a reduction on seventy pounds of steam of but about two per cent., it would seem that the latter was by far the most economical. Undoubtedly the piping for the latter is the most expensive; on the contrary, the plant at the central station will be less so. We shall await subsequent developments with much interest.

Those who care to examine the subject more extensively will find fully illustrated accounts in *Engineering* and other English papers.

CHOOSING AN ARCHITECT FOR THE BOSTON PUBLIC LIBRARY.

A LETTER elsewhere printed in this issue from an occasional Boston correspondent, in regard to the method of choosing an architect for the proposed new Public Library in that city, has more than local interest, since it touches upon the question of the limitation of the functions of a City Architect. This is a question of interest to all municipalities in which the office of City Architect exists, or where the creation of such an office is contemplated.

The point of this Boston controversy, that in the case of a building for so special a purpose as a public library the choice of an architect should be made from the profession at large, is well taken. The argument that the original competition was barren in results in this case, and that another one would be likewise fruitless, is not valid, since, if we remember rightly, the conditions of the original competition were such as to prevent the majority of the leading members of the profession from taking part. Such being the case, it would seem desirable that the trustees should be empowered to institute a competition in which the terms should be carefully considered, and, in this connection, we would commend to their attention the Kansas City Board of Trade competition. If, then, the best design should come from the City Architect's office, the Bostonians would be satisfied that the best practicable result had been obtained.

ATTEMPT TO BRIBE AN ARCHITECT.

WE have received a letter from an architect-correspondent, together with a strange communication from a manufacturer of rails for sliding doors offering ten per cent. as a bonus to the architect for his assistance in introducing the article. Our correspondent points out that this is nothing more nor less than an offer of a bribe.

Such offers, though formerly quite common, are becoming less so through the strenuous exertions on the part of the profession to make the community understand their position. An architect stands in a fiduciary relationship to his client, and such offers as this are attempts to lead him into breach of the trust imposed in him. Most manufacturers have long since learned that it is directly against their interests to make such offers, since a reputable architect under such circumstances is inclined to avoid using the article in question.

HEALTH OF EUROPEAN CITIES.

THE *Revue d'Hygiene* for October 20, 1886, contains an interesting article by Dr. Bertillon, the Chief of the Statistical Bureau of Paris, on the comparative healthfulness of the principal European cities for the year 1885, from which we take the following notes:

Typhoid fever was more frequent in the French cities than in others. At Rheims it caused, per 100,000 inhabitants, 151 deaths, at Marseilles 149, at Nancy 133, at Toulouse 79, at Havre 74, at Paris 63, and at Lyons 42. In Brussels the proportion was 19, in Amsterdam 11, in Munich 18, in Berlin 17, in Leipzig 16, in Königsberg 38, Dantzic 33, Hamburg 32, Vienna 14, Copenhagen 8, St. Petersburg 90, London 17, Manchester 21, Liverpool 31, Edinburgh 34, Dublin 55. In New York the proportion was 26, Brooklyn 23, Baltimore over 38, and Philadelphia 64 per 100,000 inhabitants.

On the other hand, scarlet fever has been less fatal in France than in other countries, the only French city in which it caused a notable mortality being Marseilles, where it was 23 per 100,000 inhabitants. In Leeds it was 63, in Liverpool 33, Glasgow 56, Dublin 50, New York 40, Brooklyn 54, Philadelphia 39, Berlin 32, Dantzic 61, and Christiana 131 per 100,000.

For diphtheria the figures are, per 100,000 inhabitants: Marseilles 98, Amiens 113, Nantes 97, Toulouse 65, Lyons 25, London 22, Liverpool 23, Glasgow 22, Edinburgh 17, Manchester 6, Dublin 8, New York 94, Brooklyn 77, New Orleans 59, Philadelphia 62, Berlin 155, Dantzic 150, Dresden 142, Leipzig 137, Munich 71, Strasbourg 55, Stockholm 122, Christiana 434, and Copenhagen 57.

The cause of death which is of great interest for purposes of comparison of the healthfulness of different localities, if accurate figures could be given, is consumption, or rather tuberculosis, since in such comparison it is desirable to reckon all the deaths due to tubercle, whether it affects the lungs, brain, or other organs.

Unfortunately, the reports are not so given that such a comparison can be made. A disease is by no means always contracted at the place of death. On the other hand, a certain proportion of those who contract this disease in a large city go to their old homes in the country or to various health resorts to die, thus making returns for cities necessarily inaccurate. Taking the figures as given, however, we find that for each 100,000 inhabitants there die from phthisis in Havre 494, Lille 463, Paris 453, Nancy 361, Rheims 340, London 205, Berlin 346, Breslau 361, Hamburg 309, Dresden 390, Leipzig 363, Munich 415, Nuremberg 475, Vienna 677, Buda Pesth 642, St. Petersburg 553, New York 371, New Orleans 394, and Philadelphia 298.

THE WESTERN ASSOCIATION OF ARCHITECTS.

WE devote considerable space in this issue to an interesting report of the convention of the Western Association of Architects, held last week in Chicago, sent us by our special correspondent. A hasty reading of it indicates action on several subjects of interest, one being the adoption of a resolution offered by Mr. J. W. Root to the effect that in the dealings of an architect with a client, among the matters of record should be the understanding that an architect is not to be held responsible for anything that might happen to a building which is put to another use than that contemplated when designed and erected—as Mr. Root forcibly illustrated when he said “making a warehouse of a building designed for light manufacturing purposes.” The other matter was the sensible action of the convention in deciding that in future there shall be no “official organ.” The debate on this question is very suggestive and instructive reading for the leading spirits in all young organizations. Mr. Charles

OUR BRITISH CORRESPONDENCE.

The President of the Institute of Architects on American Architecture—Cardiff Reservoir—Untrapped Sewer-Connections—Proposals for “Jubilee” Buildings.

LONDON, November 10, 1886.

Mr. E. I'ANSON, President of the Institute of British Architects, in his opening address for the session, said that by the study of the exhibition of photographs of his executed works, held in the Institute some months since during the life of the late Henry Hobson Richardson, the architects of Great Britain had learned that a “school” had risen in the United States, of much artistic power, promising to attain position and ultimate eminence in the architectural records of the old and new worlds. Mr. I'Anson hoped that a solid and substantial foundation of science had been laid for it, as without which no architecture, however beautiful, could ever flourish or reach perfection.

A large reservoir, in connection with the Cardiff Water-Works, has just been opened at Llanishen (Wales). The

are under the authority of the Vestry of St. George's, Hanover Square, and the Westminster District Board. St. George's is one of the highest-rated districts in London. The board drew the attention of local authorities to the matter, and recommended that it be dealt with and remedied.

Proposals for “jubilee” buildings, commemorating the fiftieth anniversary in the reign of Queen Victoria, are continually being put forward. Perhaps the latest of these proposals is the most senseless. The project is to erect a tower in the rear of the National Gallery, Trafalgar Square, 420 feet in height by 60 feet base, at a cost of £30,000 (\$144,000). It is presumed that a revenue will be earned by admitting the public to the tower, and providing them with a lift to ascend to the top. It might be useful for the Fire Brigade as a watch-tower in a fog.

SAFETY-VALVE.



RESIDENCE AT SOUTH PARK, CHICAGO.—FLANDERS & ZIMMERMAN, ARCHITECTS.

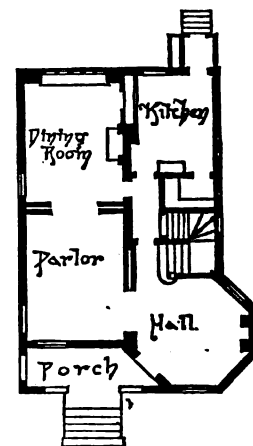
E. Illsley, in advocating the continuance of an “official organ,” stated the only advantages which occur to us, when he said that the original official organ of the American Institute of Architects was enabled to make headway owing to advertisements that came in as a consequence. This fact no doubt suggested to our Chicago contemporary the advantage of a similar relationship in the starting of the Western Association. Now, however, since it has enjoyed whatever advantage this may have been, we take it that they will find it to their interest to maintain such an independence as is incompatible with the conditions surrounding an “official organ.”

As for the association, it will never suffer, for we believe there is enterprise enough in the architectural journals of the country to report and publish whatever there may be in the transactions of interest to the profession.

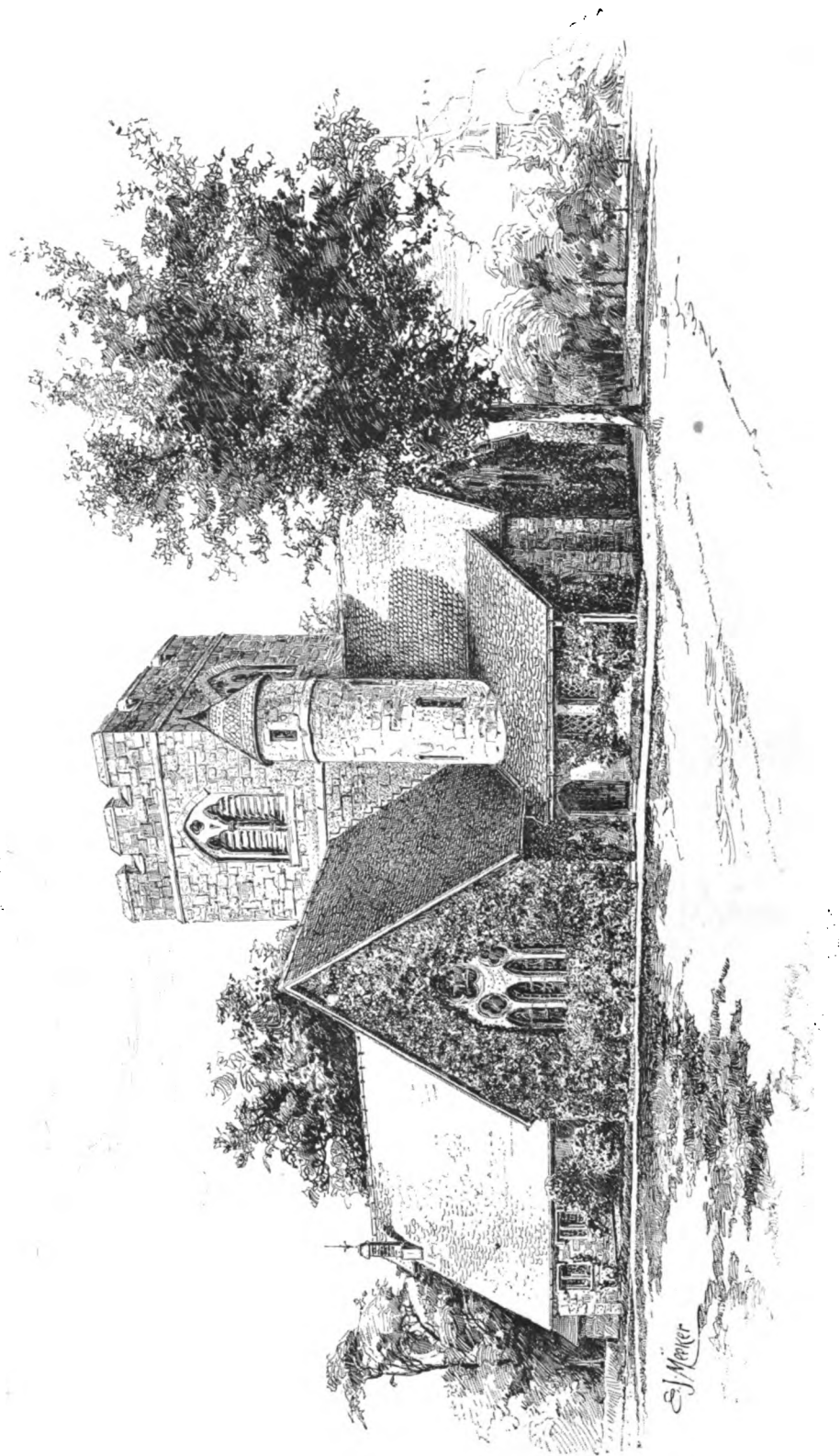
The New York Court of Appeals, the court of final resort, has affirmed the decisions of the lower courts in sentencing Charles A. Buddensieck, the skin builder of this city, to ten years imprisonment.

contractor was T. A. Walker, who has just completed the Severn Tunnel contract. The time occupied in construction is 2½ years, and the cost £75,000 (\$390,000.) The reservoir is 56 acres in extent, depth varying from 15 to 36 feet, and capacity 300,000,000 gallons. The water can be tapped at three different heights, and a scouring-valve for cleaning purposes is provided. The embankment is 1¼ miles long, its greatest width is 265 feet, greatest depth 43 feet. Along the centre line of the embankment a trench has been dug to the depth of the clay subsoil, and this trench has been puddled with clay, to make the basin watertight.

The Metropolitan Board of Works at their last meeting received a report from their Works and General Purposes Committee, in which it is stated that from a recent examination it had been found that in that portion of the main sewer extending southward from Piccadilly to the River Thames there were 152 drains and five local sewers untrapped, and in the sewer N, of the relief-weir from Piccadilly to Curzon Street, there were twenty-five untrapped drains and six untrapped sewers. The places referred to



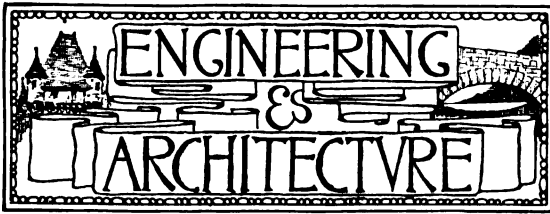
FLOOR PLAN OF A RESIDENCE AT SOUTH PARK, CHICAGO.



THE SANITARY ENGINEER & CONSTRUCTION RECORD ILLUSTRATED SERIES.

ST. BARTHOLOMEW'S CHURCH, IRVINGTON-ON-THE-HUDSON, N. Y.

RENWICK & SANDS, ARCHITECTS.



OUR SPECIAL ILLUSTRATION.

ST. BARTHOLOMEW'S CHURCH, IRVINGTON-ON-THE-HUDSON, N. Y.—RENEWICK & SANDS, ARCHITECTS.

THE subject of our special illustration this week is St. Bartholomew's Episcopal Church at Irvington-on-the-Hudson. The walls are of stone, with timber roof and floors; walls plastered inside. The original church was the nave of the present edifice and was designed by the then rector, the Rev. Mr. McVickar. The transept, tower, and new sanctuary were designed by Renwick & Sands, of New York, who presented the plans to the rector. The cost of the church was about \$25,000.

OUR ILLUSTRATION OF A MODERATE-COST HOUSE.

A RESIDENCE AT SOUTH PARK, CHICAGO.—FLANDERS & ZIMMERMAN, ARCHITECTS.

THE subject of our vignette illustration this week is the residence of Mr. William Zimmerman, at South Park, Chicago. It is of frame, shingled, stained with creosote stains to old-gold color. Cost, \$3,500. The architects were Flanders & Zimmerman, of Chicago.

BUILDERS' AND CONTRACTORS' ENGINEERING AND PLANT.

No. I.

IN beginning a series of articles on this topic, it is well at the outset to see what general principles underlie the subject, as it is only thus that right conclusions can be reached.

In all the operations of construction of whatever nature, aside from scaffolding, centering, etc., and the mechanical ones of cutting, shaping, driving to place, etc., the chief expense incurred is for the appliances or "plant" required for the complex operations of moving and placing material.

This movement is either in a vertical, horizontal, or inclined direction. The first of these gives rise to the large variety of cranes, derricks, elevators, hoisting-engines, and the like, which are also effective for horizontal displacements not exceeding a radius of about forty feet. The second has caused the evolution of the various systems of portable tracks, goliaths, cars and engines of various kinds, water-carriage, rope-tramways, and the like. The third has given rise to the methods of hoisting, or movement on inclined wire ropes, and railroad inclines. The first and second are combined also in the various traveling-crane which are so effectively used on large works.

When we come to the selection of plant for any particular work, if we would study true economy, we will begin by making a careful plan of the whole site, and of the means of access to it. It will pay also to spend some time in noting the traffic in the streets adjacent (if the work is in a busy city), so as to select that approach which will be least interfered with. For example, in constructing the anchorage and approaches of the East River Bridge, it became necessary to lay down railroad tracks in the streets from the pier on the East River to the work. Observation showed that at certain stores on the route in New York, trucks were unloading a considerable portion of the time, and had the tracks been laid in the centre of the street it would have resulted in an intermittent supply of material, and an immense increase in cost. By the simple device of throwing the tracks one side from the centre at such points, but few delays were experienced, and a great saving was made.

A second truism, which is nevertheless often overlooked, is this: every unnecessary movement of material is a direct loss; it therefore follows, 1st, that all material should be so placed that it will always be moved in one direction—viz., towards its final destination; 2d, it should never be handled twice if once will do; 3d, it should be so placed that it will not interfere with other work; 4th, the total distance moved should be as short as possible. Consideration such as these at once condemn the method so often seen of gangs of men slowly shoveling earth

from one gang to another to get it out of a pit, when it can be hoisted by one operation the entire distance, and at far less cost. A derrick conveniently located to reach over the pit will hoist a box and swing it over a cart or car, and a piece of portable track, or a few pieces in line, with a small portable car running on it, will bring the box from all parts of the pit to a position under the derrick-arm. The same engine may have a second drum, the rope from which may be led by snatch-blocks to any part of the work, and be used for hoisting or lowering material. In large works portable tracks can also be used to advantage on top of the work. The resulting economy of such arrangements, even on a work of very moderate dimensions, cannot be questioned; and a little observation will soon enable the contractor or engineer to determine when movement by hand is the cheaper, or whether it is best to introduce plant of any kind.

Now this placing of material and location of tracks and plant can be much better done on a scale-drawing in the office than it can be upon the ground; and the contractor who thus systematizes his work before beginning operations will surely do this work at the lowest cost. Much time is lost also by not placing material in good order as it is received, so that it shall be readily accessible when required, but this has nothing to do with the plant that may be used.

Having decided *where* the engines hoists, etc., shall be located, the next question arising will be the *style* of apparatus to be used.

In large operations, it is quite customary to lay out a system of derricks so placed as to cover by their swing every part of the work. These are guyed together by their tops, and supported by inclined guys leading to various anchorages. The expense of lengthening the guys and raising the supports is a large item in the case of works of considerable altitude, and for thin walls of buildings other methods are ordinarily used, to be described hereafter.

It is a question whether in many such cases the adoption of a different style of derrick would not result in economy. We refer to one in which the load can be run in toward the mast by means of a traveler or "trolley," on a horizontal arm or boom. The advantage of this form is, the boom swings clear of everything below it, and allows the load to be swung over partition-walls, or other obstacles of considerable height, so that the derrick need not be raised oftener than once in about 20 feet of elevation built. Such a means of hoisting is in use in the additions to the Equitable building, in this city, but its advantages are only partly reached in that case, since the derrick is fixed, and not arranged for swinging around.

The disadvantages of this system are, the requirements of heavier masts, and for heavy loads a system of trussing to resist the cross strains, so that the derricks are considerably heavier and more expensive. The strains in the guys are also much heavier, requiring stronger guys, and heavier or stronger anchoring.

The use of self-contained cranes, which require no guying, has been but little introduced in this country, and yet there are often conditions which would make it advantageous to introduce them. Where there is a large amount of work to be done at one point, or where the crane can be readily moved from point to point by the introduction of a line of rails and the work will warrant the expense, their use would be indicated.

On works of sufficient magnitude traveling-crane are a very efficient machine, and their use might be extended with profit.

Every case must be studied by itself, and appliances adopted which are best fitted to it. In the course of these articles it is intended to describe plant, scaffolding, centering, etc., of various kinds, and, so far as practicable, illustrate its use by examples from contemporaneous practice.

In closing these general remarks, it is pertinent to add that no more important works is intrusted to the hands of the engineer or architect than the proper proportioning of parts of the machinery and plant for temporary works. The lives of workmen, and often of those in charge of works, are at stake; and a careless passing by of a comparatively unimportant bolt or rod is a too frequent cause of accident and loss of life. When we see the miserable makeshifts that are often thoughtlessly adopted by contractors and others, the wonder is that such accidents are not even more frequent.

Every strain should be followed out and provided for, and every safeguard thrown around the work. The rule of the writer has always been that, according to the doc-

trine of chances, whatever *can* happen *will* surely happen eventually; and acting upon it has saved many a mortifying failure. Even when work has been well designed, the elements of decay set in and must be guarded against. The elder Worthington once said to the writer, that in handling the heavy castings at his pump-works, he found that after long and constant use the hooks on his crane-chains became, as he expressed it, "tired," or strained beyond endurance, and to avoid failure he found it necessary to take them off and anneal them. On the East River Bridge two such failures actually occurred, a hook failing under a load of seven tons that had many times hoisted ten and eleven tons safely. Such considerations make it desirable that the custom so prevalent abroad of employing "contractors' engineers" shall become the rule in this country, and it will tend to *become* so more and more as contractors are held to a more rigid accountability for damage to life and limb.

(TO BE CONTINUED.)

THE THIRD ANNUAL CONVENTION OF THE WESTERN ASSOCIATION OF ARCHITECTS.

(From our Special Correspondent.)

CHICAGO, November 17.

THE third annual convention of the Western Association of Architects met this morning at the Permanent Exhibit of Building Materials and Appliances, No. 15 Washington Street, with representatives present from eight States.

President Dankmar Adler, of Chicago, welcomed the delegation.

Secretary John W. Root, of Chicago, then called the roll, and the following members were found present:

From Chicago—D. Adler, R. C. Berlin, W. W. Boyington, L. D. Cleaveland, D. Druiding, Henry Lord Gay, William Holabird, H. S. Jaffry, Paul C. Lautrup, Norman S. Patton, C. M. Palmer, S. M. Randolph, J. W. Root, L. H. Sullivan, L. J. Schaub, J. E. Silsbee, S. V. Shipman, S. A. Treat, F. M. Whitehouse.

From other points—J. F. Alexander, Lafayette, Ind.; C. D. Arey, Cleveland; G. W. Bullard, Springfield, Ill.; L. S. Buffington, Minneapolis, Minn.; M. H. Baldwin, Memphis, Tenn.; John Beattie, St. Louis; C. A. Curtin, Louisville; A. C. Class, Milwaukee; F. S. Cotser, Minneapolis; C. Crapsey, Cincinnati; G. M. Knox, Kansas City; G. W. Drach, Cincinnati; E. O. Fallis, Toledo, O.; E. F. Fassett, Kansas City, Mo.; P. P. Furber, St. Louis; W. R. Forbush, Cincinnati; W. G. Gaines, St. Louis; E. S. Hammett, Dubuque, Iowa; F. D. Hyde, Dubuque; I. Hodgson, Minneapolis; H. Hohenchild, Rolla, Mo.; S. J. Hall, Columbus, O.; W. F. Hackney, Des Moines; C. C. Helmers, Jr., St. Louis; L. Kledus, St. Louis; E. H. Ketcham, Indianapolis, Ind.; J. J. Kane, Fort Wayne, Ind.; G. W. Kramer, Akron, O.; J. Kounh, Lincoln, Neb.; William Davilar, Milwaukee; H. A. Linthwaite, Columbus, O.; G. H. Miller, Bloomington, Ill.; D. W. Millard, St. Paul; S. J. Osgood, Grand Rapids, Mich.; W. L. Plack, Des Moines, Iowa; G. W. Payne, Carthage, Ill.; N. C. Ricker, Champaign, Ill.; G. W. Rapp, Cincinnati; E. G. Rueckert, Cincinnati; Alfred Rosenheim, St. Louis; Sidney Smith, Omaha; T. Sully, New Orleans; E. H. Taylor, Cedar Rapids; C. J. Williams, Dayton, O.; F. O. Weary, Akron, O.; O. C. Wehle, Louisville, Ky.; J. W. Yost, Columbus, O.

The minutes of the last year's meeting were approved without being read.

The report of the Executive Committee, Mr. W. L. B. Jenney, President, was read by the Secretary, and showed the following gentlemen proposed for membership, and they were unanimously elected: Messrs. S. B. Abbott, Springfield, Mo.; Fredolin Hair, Dubuque; L. D. Grovener, Jackson, Mich.; S. E. Desjardin, Cincinnati; A. W. Hayward, Wichita, Kan.; C. B. Cook, Chillicothe, O.; John F. Cook, Chillicothe, O.; William M. Akin, Cincinnati; Mason Morey, Louisville; E. P. Bassford, St. Paul; W. J. Dodd, Louisville; C. C. Burke, Memphis, Tenn.; J. F. Wing, Fort Wayne, Ind.; M. S. Mahurant, Fort Wayne; Eugene S. Caucka, Los Angeles; George W. Thompson, Nashville; M. F. Isbell, Goshen, Ind.; J. M. Freese, Columbus, O.; Bernard Vonegut, Indianapolis. The application of James King, of West Virginia, who alone was unknown by any member, was taken under consideration.

Mr. Boyington, of Chicago, of the committee on raising the standard of professional requirements for membership, stated that no meeting had been held.

Mr. Sidney Smith, of Omaha, being called to the chair, President Adler, of the committee appointed to take charge of the bill referring to the office of Supervising Architect of the United States, reported that they had given the matter careful consideration. They had made such amendments and additions to the bill originally proposed as were necessary to secure harmony of action with the corresponding committee appointed by the American Institute of Architects, and had had the same printed and widely distributed. The bill as prepared by the joint committee was presented before Congress by the Hon. A. S. Hewitt. After it had been before Congress a number of weeks, Mr. Burnham and the Speaker representing this association, and Mr. A. J. Bloor representing the

American Institute, paid a visit to Washington, and endeavored to see what were the prospects of the passage of the bill, and do what was in their power to expedite matters. We had a hearing, continued Mr. Adler, before the Committee on Public Buildings and Grounds, and Mr. Burnham personally also had a number of interviews with gentlemen in the Treasury Department who would have more or less influence upon the fate of the bill. The attitude of the members of the Committee on Public Buildings and Grounds seemed to be one of indifference. Mr. Stockschlager, who was chairman of the committee in the forty-eighth Congress, is not a member of this Congress, and there seemed to be no one in the committee who took a great interest in the passage of our bill. There seemed to be a fear that the free and general competition which was made one of the features of the proceedings would work detrimentally perhaps to the interests of local architects in the vicinities where public buildings might be erected. Subsequently Mr. Bloor received a letter upon the probable fate of the bill from Mr. Hewitt, in which Mr. Hewitt states that there was no hope of the passage of the bill unless there were a strong pressure brought to bear upon members of the Congress by the press and by the constituencies of Congressmen. Your committee has done nothing more towards securing the passage of the bill except in the way of seeking to influence prominent citizens in its fate, and can only recommend to the association that a similar committee be appointed by this convention to act on its behalf during the next year, and again co-operate with a corresponding committee of the American Institute of Architects, and to do all in its power to influence prominent citizens and the press in the work of the association. Your committee also recommends that the same endeavor to interest citizens and the press be made by each individual member of the association, so that we may have in every State represented in this association efforts made to secure an expression of public sentiment in favor of the bill as we have proposed it. The committee realize that the passage of this bill is a matter of extreme difficulty; they doubt whether they will be able to secure its passage by the forty-ninth Congress; but, nevertheless, it can only be passed by that, the fiftieth, the fifty-first, or any Congress, if we are unremitting in our effort to work upon public sentiment, and to work upon public sentiment in means parallel with our desires as expressed in the proposed bill.

On motion of Mr. Hodgson, of St. Paul, the report was accepted, and the same committee continued.

The committee to attend the next meeting of the American Institute of Architects was continued as follows, the appointees of last year not having had the opportunity as yet of discharging their mission: Messrs. W. L. B. Jenney, J. F. Alexander, John P. Root, Sidney Smith, J. T. Haskell. In this list Mr. Root is substituted for Mr. Hackney, who had resigned, and, on motion of Mr. Jenney, the chair was empowered to name substitutes should future vacancies occur.

Mr. S. Smith being called to the chair, President Adler, in behalf of his committee on Statutory Revision, said that the bill specially placed in its charge sought to regulate the practice of architects in the different States, and while little progress had been made, the bill had been printed and should be pushed to a passage in the sessions of the legislatures that are to take place during the coming winter. There are seven or eight States represented in this association that will have such sessions of the legislature. I would recommend, and I think I do this with the concurrence of the members of the committee who are present, that, as far as the voting of our bill in the individual State legislatures is concerned, this be made the task more particularly of special committees appointed by the State associations in the States which will have sessions of the legislature, and that, where there is no such organization, there the architects represented in our association select one or more of their members to make this effort. Your committee makes this recommendation for this reason, that it is impossible for the president of this association, or for the members assembled here in convention, to make a selection of the men best qualified to do this work in the various State legislatures. Your committee also recommends that while the committee has endeavored to so form the proposed enactment or to comply as nearly as possible with constitutional provisions as far as the committee itself could see them, still many of these vary in the different States; that, therefore, three sub-committees, the appointment of which we recommend, be empowered to make such changes, such deviations from the bill as we have prepared it, as will make it best adapted to the peculiar local situation existing in the different States. Your committee believe that harmony of legislation can be secured if such slight modifications are made to satisfy the individual requirements in each State. With reference to the bill regulating the office of Supervising Architect, which is also, to a certain extent, in the hands of this committee, nothing has been done.

On motion of Mr. Randolph, of Chicago, it was voted to continue a committee on the subject, its members to be selected in each State by the State Association or members of the Western Association resident in any State which had no local organization.

Liberal reductions were reported for return tickets on the C. & A. and C. B. & Q. R. R.

Having announced new business as next in order, President Adler suggested the importance of action on two weighty matters—namely, the election of officers and the selection of the place of next meeting, at a stage earlier than in preceding conventions, and thus avoiding hasty and perhaps ill-considered results. A motion would therefore please him, looking to the appointment of two committees,

each composed of seven members, "whose duty it shall be each to place in nomination first the place for holding the next convention and record a list of names of members whom they propose as candidates for the various offices." The best men being placed on such committees, their interplay of action would overcome the over-modesty of members, possibly on one or other of the committees, whose elevation to office meant the best good of the association.

Mr. Hodgson, of St. Paul—I move that the chair appoint the two committees as has been suggested.

Carried, and the chair promised to announce the committees speedily—not later than next morning.

The chair stated that the Secretary had received divers communications from patentees of processes supposed to be of interest to the profession. What should be done with them? On motion of Mr. Rapp, of Cincinnati, they were directed posted just without the hall.

Adjourned till 2:30 P. M.

On the reassembling, the chair announced the following as the two committees last provided for in the morning:

On the place of holding next convention—Messrs. J. F. Alexander, Lafayette, Ind.; L. S. Buffington, Minneapolis; William Holabird, Chicago; L. D. Cleaveland, Chicago; C. C. Hellmers, Jr., St. Louis; G. W. Rapp, Cincinnati; Mrs. Bethune, Buffalo.

On nominating next year's officers—Messrs. D. W. Millard, St. Paul; S. M. Randolph, Chicago; E. S. Taylor, Des Moines; Sidney Smith, Omaha; Samuel H. Treat, Chicago; C. A. Curtin, Louisville; P. P. Furber, St. Louis.

Treasurer S. H. Treat reported that he had received from his predecessor, D. Adler, \$27.68; subscriptions for dues to date, \$828; interest on U. S. bonds, and profit on sale of the same, \$26.25; total receipts, \$881.93. The disbursements had been \$190.91; balance on hand, that morning, \$741.02, to which should be added \$100 in dues just collected, and more of the same revenue yet to come.

Mr. Hellmers moved that the chair appoint a committee of three members from each State association to collect legal decisions relating to building interests, to report at the next convention, and it was so ordered.

From the Committee on State Organization, Mr. J. F. Alexander presented an interesting report in behalf of himself and his colleagues, Messrs. C. R. Ramsey, Missouri; E. H. Taylor, Iowa; I. Hodgson, Minnesota; H. P. McDonald, Kentucky; C. W. Rapp, Ohio; D. H. Hartenue, Wisconsin; Sidney Smith, Nebraska; W. H. Cusack, Tennessee; T. Sulley, Louisiana; S. J. Osgood, Michigan; S. A. J. Preston, Texas; Mrs. Louise Bethune, New York. In the report the committee state that they have met with cordial co-operation and had successfully organized State associations in the States of Minnesota, Iowa, Illinois, Nebraska, Kansas, Missouri, Ohio, Texas, and Indiana, all of which are working in an harmonious and satisfactory manner. Mr. Hartenue, of Wisconsin, asks that one member from Milwaukee be added to his committee. Mr. Osgood, of Michigan, asks that one member from Detroit be added to his committee. Mrs. Bethune's committee from New York State has organized the Buffalo Society of Architects, numbering fourteen, who are working in an harmonious manner, and she has now turned her attention to various other cities of the Empire State with prospect of success.

The report was received with applause, and the committee continued "until associations are organized in every State." The additional members asked for in Wisconsin and Michigan will be appointed by the chair.

N. S. Patton—Has an association been formed in Wisconsin?

President Adler—I understand not, an additional member being desired for that purpose. An unfortunate selection—good personally, but bad by reason of geographical isolation—had operated against a prompter organization.

Mr. Patton—I understood that a local association has been formed in Milwaukee. Would it not be well to let that association take charge of forming the State organization, say by resolving itself into such?

President Adler—The Chair will adopt your suggestion to this extent that he will ascertain who is the leading member of the Milwaukee association and will appoint him the associate of Mr. Hartenue on the Committee on State Organization.

Mr. Louis H. Sullivan, who was billed for a paper on "Inspiration," then took the floor. By way of preface he said that to write an essay on such a subject was like writing an essay on eye-sight, which practically could not be defined intelligibly, statistics and analysis rendering no service. Inspiration also was a thing of life, and in dealing with it, therefore, he discarded matter-of-fact language and resorted to metaphor as a means of catching some of its vital essence. His subject had to do with architectural inspiration, because having to do with all inspiration.

Mr. John W. Root offered the following:

Whereas, In the case of each building constructed from the design or under the supervision of a member of this association, the owner of the building should be supplied with full data of all essential points involved in its construction.

Resolved, That the Board of Directors have printed and mailed to each member of the association a printed blank, the object of which shall be to supply to the members, under the seal of the association, a schedule of all points in

relation to which the Board of Directors deem it desirable that the client should be informed, and at the same time to enable members to disclaim responsibility when the building constructed for one purpose is used for another.

In explanation, Mr. Root said it frequently happened that buildings erected for one purpose were used for another, with very serious damage through no fault of the architect. It could not be expected that a building designed for light manufacturing should serve as a warehouse. The resolution was passed unanimously.

Adjourned till 10 A. M. Thursday.

SECOND DAY, NOVEMBER 18.

At the opening of the second day's session, President Adler in the chair, power was given the Executive Committee to revise the list of newly elected members, as a few were really ineligible, owing to not being engaged exclusively in the practice of architecture.

Mr. Curtin moved to revise the membership from the beginning, in accordance with the same test. Carried, and the Board of Directors will notify all who by misapprehension have been improperly admitted to membership.

Mr. Boyington, from the committee on raising the standard of professional requirements for membership, held that Article 4 of the Constitution sufficiently provided for the matter.

Mr. Sidney Smith, of Omaha, moved that all applicants for membership recommended by the Board of Directors be hereafter voted upon by ballot, five ballots against any applicant to work his exclusion. He said that this procedure, entirely analogous to the action of similar societies, was a desirable safeguard.

Mr. Yost thought that the canvassed applicants should be treated with deliberation, and that criticisms should be communicated to them.

A member said that one applicant had been admitted the day before against whom certainly sixteen votes would have been recorded but for the precipitate course followed.

Mr. Yost moved as an amendment that names of applicants be read in open session at least one day before action by the Executive Committee.

Mr. Furber moved as another amendment that the Board of Directors be given the names of candidates at least thirty days before the convention and that the directors send down such names to each member of the association.

Replying to a question, the chair said this course would apply only to those who are not members of the State associations or the American Institute of Architects.

Both amendments were lost, and the question was called on the Smith resolution.

Mr. Curtin—I suggest an amendment that also all members of State associations be admitted only by ballot to this association; or, will that require an amendment to the constitution?

The Chair—Yes, sir; and the matter can be brought up any time.

Then the Smith motion was carried unanimously.

Mr. Alexander—I move that the association issue a certificate of membership to all in good standing, under the seal of the association.

Mr. Shipman—I suggest that it be appropriately engraved. Suggestion accepted by Mr. Alexander.

Mr. Buffington—And let the certificate state that the bearer has been in the actual practice of the profession for the past three years.

A member—I have been practicing only two years, but am a member here. How will that affect me? [Laughter.]

The Chair—I presume the certificate is designed as an ornamental addendum, not as credentials.

A voice—What would happen should the holder of such illuminated text get fired out for non-payment of dues? Would he surrender the vellum, or must it be taken away from him?

An Iowan, sarcastically—I move that we receive a certificate apiece, that we have been in Chicago on this date, and have paid our fare and board-bill. [More audible smiles.]

An Indiana delegate—We are on the eve of trouble in the Indiana Association of Architects, caused by the membership question, and it will probably result in the reorganization of the State association, and it may also result in commotion here in the Western Association. [Cries of question.]

Mr. Baldwin—Length of practice should make no difference on paper; it doesn't in practice. [Loud applause.]

Mr. Buffington's time-limit clause was blackballed, and laughter greeted a member's motion that the proposed certificates should run only for one year and be renewable annually.

Mr. Yost—I am opposed to this whole certificate business.

A Kansas delegate thought that such a document might work well in the collection of fees, where litigated.

The Chair—I have found that the courts do not pay any attention to a certificate of membership in an association.

Col. Shipman—A receipt for dues in this society will be about as good a certificate as any member needs. After this discussion I think it better that the matter of certificates of membership be postponed till the next annual meeting.

A chorus—Second the motion. And it carried.

The following new members were elected; Henry Walters, Louisville, Ky.; F. Hair, Dubuque, Iowa; E. J. Eckles, Missouri; H. T. Kley, Chicago; Frederick Kees, Minneapolis; T. J. Grodavit, Leavenworth, Kan.; Merritt J. Reid, Evansville, Ind.; J. Mulvey, Aurora, Ill.; William Zimmermann, Chicago.

Two communications were read from Secretary Bloor, of the American Institute of Architects, one addressing Mr. W. L. B. Jenney, as the institute's delegate to the Western Association of Architects, and the other a fraternal telegram as follows: "The Board of Directors of the American Institute of Architects, now in session, send hearty greeting to their sister association of the West." [Applause.]

A member—I move that the Secretary be authorized to properly respond to that dispatch, the last one read. Carried unanimously.

Mr. Hammett—I move that Mr. Jenney, as the representative of the American Institute, be escorted to the side of the Chairman on the platform. Carried, and the chair named Mr. Hammett for that duty.

The Chair—Gentlemen, you will now have the pleasure of listening to the paper of Dr. De Wolf, whose services in the cause of reform in the sanitary construction of buildings, and whose contributions to sanitary science at large have been so great that they cannot be over-estimated by any of us.

Dr. De Wolf discussed the relation of architects to State medicine. An abstract of his paper will be given hereafter.

Cordial thanks were returned to the speaker by the chair.

City Engineer S. J. Artingstall was introduced, and read a carefully prepared paper on "the proportion of joints and connections in structures." Defective work in rivets was illustrated by a diagram. It was a question for the designer to say whether the hole for the rivet should be punched or drilled. The distribution of the rivets was of highest importance. The proper size of the pin was considered with the same accuracy of technical language. All portions of joints should be made as simple as possible. In nothing was there room for nicer work, and the value of a structure could be judged by the fitness and symmetry of its connections.

The Chair—Mr. W. W. Boyington, the Nestor of the profession in Chicago, the first, I believe, who established by his practice in this city that an architect should be an architect only, and should be in the employ of the client only; whose example has done more toward elevating the character of our profession at large in this city than anything else done by any other practitioner among us—Mr. Boyington will now read a paper.

Mr. S. M. Randolph, in behalf of Architects Bauer & Hill, invited those who were curious to inspect a difficult piece of reconstruction they were now engaged on at the corner of Franklin and Adams Streets, an eight-story building adjoining high buildings on either side, and upheld entirely on screws until the additional weights were exactly determined. They had to take out foundations from under a smaller building alongside and replace them with larger ones, and it being found now that that smaller building had not changed its level, consent had just been given to have solid masonry replace the screws.

Messrs. Millard & Curtin, of the committee appointed a year ago on the subject of a possible change in the standard of measurement from the duodecimal to the decimal subdivision, submitted a report. After praising the Arabic system of notation, which had swept away other systems, the report commended the entire metric system which had found many advocates, but had failed of general adoption, chiefly through the opposition of manufacturers. A less radical change would be the introduction of the decimal system. The change would give greater ease and certainty in calculations. The system was recognized in our coinage, and would be equally satisfactory here. Yet manufacturers would certainly still object. The committee therefore recommended that there should be a period of debate and preparation. Architects themselves might introduce the system in their offices, but would have to contend with the perplexities of different measures in many manufactured articles used by them. It might be well to have a committee of two or more to canvass the question if the change were practicable, and especially to communicate on the matter with related societies, this committee to report at the next meeting. Incidentally it was stated that in St. Louis the city government calculates decimally, and retranslates into the old system for the convenience of contractors. Also, as part of the report, a letter was read from Mr. E. T. Carr, of St. Louis, a member of the committee, favoring the whole metric system, but recommending no other action now than the appointment of such committee, to prepare an address to the various mechanical societies and others, with such suggestions as they might deem proper.

Mr. Patton said that to subdivide the foot by ten would do away with the universally-received inch. This he was opposed to, unless as a part of a general adoption of the entire metric system, which he approved. To go at things piecemeal was not the way to reach the desired end.

Mr. F. Baumann wanted the committee. In Germany they had the duodecimal system for centuries, a very mixed system indeed. When the rectification came everybody was satisfied with it, and no one bankrupted, nor did he believe any one would be here. The decimal system was a system in accordance with common sense, and the little trouble incident to its adoption would soon be overcome.

Mr. Jenney agreed with Mr. Patton. Let the unit of measure be made here as in France, the unit of weight also. If we make any change at all, we should take the metric system *in toto*.

President Adler said the change in Germany was a radical one, such as proposed by Messrs. Patton and Jenney, the change in the metric system embracing not

only the measures with which architects deal—the measures of length—but also the measures of volume and of weight; and it would be injudicious if we, as architects, were to propose the adoption of simply a little trifling reform referring only immediately to the one unit of measure, simply by ourselves in our work. If we really desire the decimal system, we should unite with those of other professions who are endeavoring to secure a general adoption of the metric system. There being no motion before the house, it may be well to suggest that the sense of the association be taken with reference to its attitude as regards the wider range of action—that is, as regards the adoption of the metric system as a whole.

A hungry member suggested lunch, and on motion of Mr. Yost, further consideration of the subject was postponed.

The afternoon exercises opened with a thoughtful paper by Professor N. Clifford Ricker, of the State Industrial University, Champaign, Ill., it presenting "The grammar of architecture," and some high prophecies concerning a coming American architectural style. Each style, he held, has its special genius. Nowhere is it proved that the capacity of architecture is exhausted; contrariwise, a new American style may arise. As grammar gives us the bone, the flesh, the soul of literature, so in architecture we have construction pure and simple, which may be called the bones of the science; then comes decoration, its flesh; but its genius is that divine harmony of construction and decoration which endows the structure with life. Architectural grammar combines the three. The massive tower may be as beautiful in its way as the polished column. Only that architect whose soul does pulsate in harmony with the genius of a style can revive a past architectural style, or hope to evolve a new one worthy the attention of history. We may define architectural grammar in its principal sense as being the way to obtain beautiful and effective results in architecture in any or all of the following ways: First, by the innate beauty of the material used, its crystalline depths, its varied color; second, by the mode of treating the external surface of the material adopted as in stone-cutting; third, by contrast or harmony of color and texture in the various materials employed; fourth, by the use of forms beautiful in themselves aside from their application; fifth, by the method employed as in projecting or emphasizing certain details; sixth, by the centralization and accentuation of some particular feature until it rises as the key-note of the design; seventh, by the suitable decoration of the interior by color or form; eighth, by the use of sculpture as in bas-reliefs; ninth, by the furnishing of the interior; tenth, by the use of painting, historical or decorative, to ennoble the interior. In ideals, all these elements may be present; the Grecian, Roman, Renaissance, and modern styles, use them one or all, and by these criteria art may be adjudged. General principles are laid down on high authority for our guidance. The great merits and surprising eccentricities of Ruskin are most widely known of architectural writings. He enters into the spirit of those who made the masterpieces of the Middle Ages, but is always biased in favor of France or Italy, and seems never to have appreciated the nobility of the Greek, Roman, and Renaissance styles. The ideal writer would treat without bias all these styles and every other. The great difficulty in the way of modern architecture is that there are so few available books on the subject. The husk around the kernel is treated of voluminously, but hardly any writer except Ruskin has dwelt on the great underlying methods and motives. In the Ecole des Beaux Arts the office method is employed, the students learning from teachers, not from any fixed textbooks. They have good taste and form, although often joined with bad construction, as may be seen by almost any monograph of recent French architecture. The school of architecture at Berlin would admit nothing except what was Greek, or semi-Greek. Thus a full tuition is given in a particular style, and the student can only acquire a wider culture by freeing himself from the mannerisms involved in his training. The late Mr. Richardson was trained in this way, devoting most of his attention to the Renaissance style, probably only incidentally studying the Romanesque. But he found little demand for Renaissance here, and he gained his element in the great broad Romanesque. His thorough knowledge of a particular style was simply diverted into a new channel. Very few architects could have such a tuition, and must study buildings, and especially photographs of buildings. This will soon elevate the character of American architecture to a point where the development of a new and national American style of architecture may be confidently expected. We have a race compounded of all European nationalities, with wealth to build buildings of almost any magnitude and expense, and already results in our chief cities compare with those of almost any time or style. There is high ambition and large achievement. With all these favoring conditions, it does not seem too sanguine to anticipate the growth of a style here at no distant day rivaling those of the past. Whether this result is attained depends largely on the thorough study of architectural grammar by each and every member of our noble profession.

Mr. I. Hodgson, of St. Paul, was followed on the platform by loud applause. Bowing his acknowledgments, he began briskly one of the best received addresses of the convention, a typically Western one, its subject being the best way to expedite the American architecture of the future. Since he had come to Chicago, he said, he had jotted down hints on a national style of architecture. It should be considered American. We

can't discard precedent, but we can combine, improve, and select, which will entitle us to a style which we can call our own. Perhaps some of you will say that that is just what we are doing. If so, allow me to say that you are laboring under a mistake. "We are trying to introduce something fresh," you insist. Yes, sir; so very fresh that it needs a little Attic salt to prevent some of our architects from becoming a nuisance to good taste and a rational understanding. Higher ideas must be worked for, and to effect this there should be harmony and organization, and the Western Association should be prominent in the work, representing many or all of the degrees of culture and refinement. True patriotism alone would incite to this important reform. All honor to our great republic, the equal of Greece and Rome in their palmy days, notwithstanding the enchantment lent by distance. We do not underestimate the accomplishments of our brothers in the so-called classical period. Some see no excellence in architecture except in the classical and Gothic schools. The style descanted on by professors of architecture is ever architecture at its culmination in Greece, as if we had only to imitate a people whose time was spent largely in establishing mythology and erecting temples to their deities. Base is the imitator, even of architecture prepared by the gods themselves, if that were possible. We recognize no Olympus now; ours are the real temples, those of science, art, commerce, and manufacture, by which peace is brought to the greatest of all temples—our homes. Ours is the happiest and highest civilization ever known. In the providence of the grand Architect of the universe, people have evolved that which was allowed to them, using the best light given them. Honor to our brothers in all ages whose faithful labor and whose lives were devoted to the cause for which we are here assembled in convention, but while we revere the memory of the fathers of our art, let us do justice to ourselves, and leave to the past the ideal where it should certainly belong. We are in favor of the best, but we are in favor of fitness, without which there can be no excellence—the fitness of things is what concerns us most. Architectural styles should be created to meet necessities. Hence the Renaissance, that brought greater glory to France and Italy than all their blood-bought victories. Old style things are of second importance here; our age is a glorious reality, a practical age. To meet the demand for art novelties we are straining every nerve. Bold empiricism had too long usurped the place of architecture. The argus-eyed press critics are in the field, and with their good common sense we may soon expect to hear from them in the way of enforcing the necessity of prompt and vigorous action. The fault of not adapting architecture to the age does not lie with the legitimate architect, but will be charged as above indicated, and old-fogysm will speed yet more rapidly to the rear. The noble army of civil engineers hear the music and grandly keep step in the march of reform and progress. Hundreds and millions of dollars are expended annually in the erection of every kind of building. "Who was the architect of Babel?" asked an architect. "Didn't have any," was the answer. "Hence the confusion," replied the architect. To-day the services of an architect are as necessary to prevent confusion, and his services are generally acknowledged to be indispensable. We must proceed to the establishment of a national school based on national principles exclusively, the title of which should be the American School of Architecture, and foremost among its supporters should be the members of our Western Association, and they should pledge themselves as follows:

First—That they will faithfully and honestly, to the best of their ability, endeavor to improve the civil architecture of America, and that they will render all the aid in their power in the construction, development, and perfection of the national style of architecture known as American.

Second—That in doing so, they will in the construction of buildings of every class be wholly governed by the laws of mechanics, or scientific rules, on the subject.

Third—That they will confine themselves, as far as practicable, to such simplicity and breadth of design as will produce the longest unbroken perspective line, and the greatest dignity and repose in all their works.

Fourth—That they will carefully study and practice economy, using only such quantity and strength of material, of whatever kind, as shall be warranted and justified by the accepted authorities on the subject.

Fifth—That they will strictly observe the law of practical fitness, excluding all barbaric crudeness, massiveness, and severity, and give a truthful and spirited expression of purpose to all their creations.

Sixth—That in the matter of fenestrations of every structure they will introduce only the free form of arch and lintel that will serve convenient or aesthetic purposes.

Seventh—Regarding columns, pillars, etc., that they will introduce parallel shafts and regulate their height by the safe value and measure of the material employed in their make-up to safely sustain the superimposed loads, and that when in order they will completely and gracefully mold their bases and capitals, enriching the latter with spirited carvings, representing native fruits, flowers, and foliage, or geometrical patterns, or both.

Eighth—That in all lintels, architraves, vousoirs, etc., the actual known value of the materials used to sustain their own and superimposed weights shall be their dimensions.

Ninth—That they will not project belt courses, cornices, copings, pediments, gables, etc., over a standing wall-line to a greater extent than is necessary for protection and just ornamentation.

Tenth—That in the roofs, chimney shafts, parapets, etc., of all their structures they will endeavor to produce

the best picturesque effects in the most unpretentious and monumental way, avoiding unnecessary breaks and as far as practicable unusual angles in the roof contour.

Eleventh—That when dormers are introduced they will make them moderate, not numerous features, and graceful withal.

Twelfth—That they will introduce no exterior decoration except that which is necessary to properly accentuate or relieve particularly plain surfaces, using geometrical patterns, native plants, foliage, fruits, and flowers, and appropriate selections from the lower animal kingdom for the purpose.

Thirteenth—That they will in all interior decoration endeavor to produce harmony with the exterior except where it may be necessary to vary for special or convenient purposes.

In this way, continued the speaker, one might proceed indefinitely, requiring equal power of mind and force of will to place it before the profession. The members of the proposed new school should be at liberty to practice in any other style, giving, however, the preference to the new.

The Chair—I wish to say, as illustrating the modesty of our friend Hodgson, when he speaks so deprecatingly of modern American architecture, of which his own is certainly a part, that in the French journals, quotations from which I had the pleasure of placing before you yesterday and which were so heartily and enthusiastically commendatory of the character of modern American architecture, the work of Mr. Hodgson had been particularly singled out for illustration.

The last paper of the day, as also the last on the programme for the convention, was then submitted by Architect E. H. Ketcham, of Indianapolis. His compact and interesting statements of fact embodying the result of his experience in the erection of insane asylums, premising that the northern, eastern, and southern hospitals for the insane can accommodate all of Indiana's 3,530 insane people, a proportion of 1 to every 558 of the population—in Cook County, Ill., it was one insane person to every 390 inhabitants. [Laughter.] He went on to show that the three institutions illustrate respectively the corridor system, the house system, the pavilion system, and the cottage system. The corridor system was least in vogue now, though formerly used generally, the individual rooms opening into a wide common corridor. The house system has a more complete separation of day and night rooms, the second story being used exclusively for dormitories. The pavilion system is essentially the same as the house system, only with more extensive features. The cottage system includes a number of small buildings—from 14 to 20, at Richmond, Ind.—like private dwellings. In all the Indiana hospitals great efforts are made to make the places homelike, and the grounds are ample. The pavilion hospital, at Logansport, has a central administration building, the various pavilions being distant some fifty feet, three of these outlying buildings being for special disorders. Halls extend the full length of the low structures and loggias give open-air exercise. At the eastern or Richmond hospital the cottage system is something of an experiment. Every effort is made to imitate the modern cottage, except that there is one common dormitory, situated in the main building, where the right wing is for men and the left for women, with other accommodations for the employees, the kitchen and amusements, including a dancing-floor. The hospital at Evansville, on the Ohio River, includes a 3-story central building of blue Bedford stone and brick, 59x102 feet, with wings radiating at an angle of sixty degrees. Heated air is brought through the corridors and through open door-panels into the rooms. Water-closets at all the hospitals are, where used, out of the buildings, and, while the speaker did not go into details, he claimed a first-class provision in every case for ventilation, lighting, heating, sewerage, water, and fire-protection.

Adjourned till ten o'clock Friday.

The Chicago Architectural Sketch Club, taking advantage of the presence of the Western Association of Architects, have announced the "first annual exhibit of the club" as open at 157 La Salle Street. The attraction is home-made sketches, and the architects are patronizing the show liberally and speak highly of it. Mr. Harry Lawrie is the president of the enterprising draughtsmen.

Mr. D. H. Burnham, who was expected to read a paper on the opening day, was called away to New York.

The Executive Committee has had several meetings, the chief one just before the convention opened, and it is said there was quite a demand made by an Indianapolis architect against having the newly formed association in that State recognized by the convention. The soiled linen, however, was remanded back to the Hoosier wash-tub. An unusually large number of applicants for membership were approved.

Mrs. Bethune, the one lady member of the convention, bears the distinction with quiet dignity. She exercises the right of suffrage on the important committee on nomination of officers, and it is whispered that she herself, both on her own account and in compliment to the Empire State, received several votes in committee for President.

Thursday at 2 P. M. an informal and much-enjoyed lunch was served at Kinsley's and participated in by all the Chicago members of the Western Association and the visiting profession. A year ago the official banquet was abolished, but Chairman S. A. Treat, of the Local Committee on Entertainment, was not to be denied this pleas-

ant substitute, and the salads, ices, and punches were supplemented with not a little sociability.

[The proceedings of the last day, with election of officers, appointment of committees, etc., will be found on page 620.]

THE BOSTON PUBLIC LIBRARY BUILDING.

(From an Occasional Correspondent.)

BOSTON, November 19, 1886.

IN 1883 the trustees of the Boston Public Library were authorized to expend a considerable sum of money to secure, by competition, designs for a new library building.

The articles of competition drawn by them found so little favor with architects that no satisfactory plans were submitted.

The appropriation was exhausted upon this competition, and having no power to employ a special architect, the trustees were forced to apply to the City Architect for the design of the building, but with no satisfactory result even at this late day; no design for the exterior submitted by him having been approved by the trustees, the floor plans even not being fully decided upon. It is therefore apparent that the trustees are not pleased with the efforts of the City Architect, and unless power is given the trustees to choose some other architect the building of the new library is likely to be indefinitely postponed.

Whether the design of such a monument should be entrusted to a city official, over whom the board nominally in charge of the construction of the building have practically no control except that of veto power over his designs, has been a question that attracted considerable public attention. And each one of the numerous letters and editorial articles which have appeared in the Boston newspapers upon this subject has taken the ground that it is best that such buildings should be entrusted to a special architect whom the board should select on account of proved capability for treating such problems.

If the Boston city government relieves the trustees from their present embarrassment by allowing them to work through an architect of their own choosing, they will not only do well in the present exigency, but they will act most favorably for the best architectural results in the future by thus limiting the duties of the City Architect to the designing of ordinary municipal buildings. It is not reasonable to entrust such important works as this library to an official of whom, under present conditions, is demanded professionally only that he should be able to conduct the ordinary city work, aided by the traditions of the office.

No more evidence is needed that it is unwise to allow such an official to depart from his normal functions by entrusting him with the design of buildings of extraordinary requirements and importance than the present embarrassment of the Boston Public Library Trustees.

THE WATER-TOWER AT VICTORIA, TEXAS.

WE are indebted to the *Scientific American* for the following information and illustration respecting the partial collapse of this tower, by Mr. R. W. Layton, of Victoria:

"On the 20th of August this place was visited by a very severe cyclone, the wind reaching the velocity of about eighty miles per hour. We have a system of water-works with a reservoir or stand-pipe 16 feet in diameter and 100 feet in height; the iron is $\frac{1}{2}$ -inch thick for the first 70 feet and $\frac{3}{4}$ -inch the remaining 30 feet. This pipe was erected with all the care and skill used in the construction of a steam-boiler, but during the storm it was swayed to and fro, and the sides swerved in and out like some huge animal striving for breath until it finally collapsed as you see it in accompanying picture."

The correspondent sends three different views and states that a discussion is going on as to the cause of the collapse, and expresses the opinion that it was the result of a partial vacuum caused by the wind passing over the top of the pipe, as the pipe had but 70 feet of water in it at the time. He also states that the upper edge of the pipe was re-enforced by a heavy angle-iron.

The *Scientific American* makes the following comments:

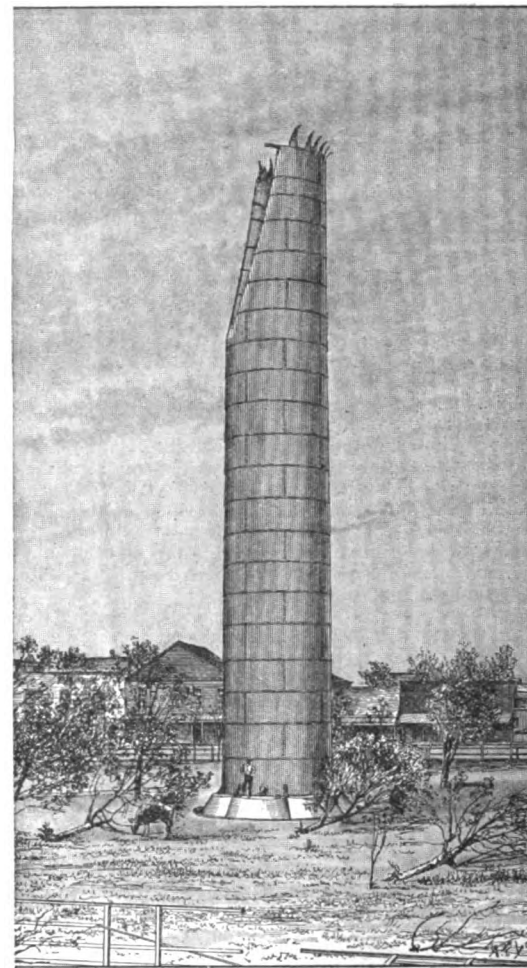
"The collapse of the stand-pipe seems to have been on the side from which the greatest pressure of wind occurred, as by inspection of the photograph the trees near the stand-pipe, which were probably overthrown at the same time as the collapse, all lie in one direction, and that coincident with the direction of compression in the stand-pipe. From our inspection, the tornado was not central over the stand-pipe,

but far enough on one side to give it the full force of its gyration. This, in our opinion, precludes the possibility of a vacuum being the cause of the collapse.

"The thinness of the iron, $\frac{1}{2}$ -inch, and its great proportional area exposed to the force of the wind, will no doubt readily account for its swaying, buckling, and final collapse, if we only take into consideration the force of the wind in pounds per square foot of exposed area.

"Tornado winds blow at a rate of from 90 to 100 miles per hour and exert a force of from 40 to 60 pounds per square foot of area.

"The mean area exposed above the water-line, all of only $\frac{1}{2}$ -inch iron, may safely be taken at 300 square feet, which, at 40 pounds per foot, would amount to 12,000 pounds, or



six net tons pressure on the windward side, with no support on the inside, while the leeward side was supported in tension by the small partial vacuum of a lee wind, which is equal to the slight vacuum or draught caused by blowing across an orifice, as the other parties claim. We are confident that lateral pressure caused the collapse of the stand-pipe."

[It will be noticed in the picture that the lower end of the collapsed portion is at almost exactly the lower edge of the lowest thin section, and we have no doubt that our contemporary is correct in assigning the cause of the failure. Our readers will remember that at the time of the failure of the Kankakee water-tower, described in our issue of October 30, the same panting motion was described. The iron in the top plates in this case was but one-eighth of an inch thick, and there was no bracing. It is evident that in all such cases collapsing strains must be provided for as well as others.—ED.]

THE PHILADELPHIA WATER-SUPPLY.

THE final report of Mr. Rudolph Hering, C. E., on the examinations of all practicable sources for the future supply of water to Philadelphia, which have been made by him during the past three years, was presented to the City Council Water Committee on the 4th inst. The general conclusions reached by Mr. Hering are given on another page.

This report is a very complete summary of one of the most thorough and exhaustive examinations ever made of the sources of supply for a city, and the descriptions given of the methods pursued and the reasoning which led to the conclusions reached make it a valuable work of reference for engineers, and carry it far above the level of ordinary

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NEW YORK, NOVEMBER 27, 1886.

[NUMBER 26

Proposals.

U. S. ENGINEER OFFICE,
JACKSONVILLE, FLA., November 22, 1886. {
Sealed proposals, in triplicate, for dredging in Apalachicola Bay and at the mouth of the Carabelle River, Fla., will be received at this office until 12 o'clock, noon, standard time, on the 22d of December, 1886, and will be opened immediately thereafter.
Specifications, instructions to bidders, and blank forms for proposals may be obtained at this office.

W. M. BLACK,
1st Lieut. of Engineers, U. S. A.

HAY LAKE CHANNEL.

UNITED STATES ENGINEER OFFICE, 34
West Congress Street, Detroit, Mich., November 16, 1886. Sealed proposals, in triplicate, will be received at this office until 2 P. M. December 16, 1886, and then publicly opened, for excavating at Middle Neebish, Hay Lake Channel, Michigan. The Government reserves the right to reject any or all proposals. For further information apply at this office. O. M. POE, Lieut.-Col. of Engineers, Bvt. Brig.-Gen. U. S. Army.

U. S. ENGINEER OFFICE, 89 EUCLID AVENUE,
CLEVELAND, OHIO, November 12, 1886. {

Sealed proposals in duplicate, addressed to the undersigned, will be received at this office until 11 o'clock A. M. Monday, December 13th, 1886, for constructing 1,200 linear feet, more or less, of the East Breakwater at Cleveland, Ohio.

Forms, specifications, and other information can be obtained at this office.

The U. S. reserves the right to reject any or all proposals.

The sum allotted for the work, inclusive of the amount necessary for superintendence and office expenses, is about \$130,000.

L. COOPER OVERMAN,
Major of Engineers.

PROPOSALS FOR ROCK EXCAVATION AND DREDGING.
U. S. ENGINEER OFFICE, 89 EUCLID AVENUE,
CLEVELAND, OHIO, November 10, 1886. {

Separate sealed proposals, in duplicate, will be received at this office, until 11 o'clock A. M. Friday, December 3d, 1886, at which time they will be opened in presence of bidders, for Rock Excavation and Dredging at Ashtabula Harbor, Ohio.

Proposals will be accompanied by a written guarantee that in case the bid be accepted, contract will be entered into with good and sufficient security within ten (10) days after notice of such acceptance.

Forms, specifications and other information can be obtained at this office.

The United States reserves the right to reject any or all proposals.

L. COOPER OVERMAN,
Major of Engineers.

IMPROVING JAMES RIVER, VA.—PROPOSALS FOR DREDGING AND ROCK EXCAVATION; CONSTRUCTION OF MATTRESS-DYKES; AND CONSTRUCTION AND EXTENSION OF JETTIES.

U. S. ENGINEER OFFICE,
905½ E. MAIN ST., RICHMOND, VA., Nov. 10, 1886. {

Proposals for dredging and excavating rock from the channel of the James River, near Richmond, Va., for the construction of Mattress-Dykes, and for the construction and extension of Jetties, will be received until noon of December 8, 1886, and opened immediately thereafter. Blank forms, specifications, and information can be had on application to this office.

WM. P. CRAIGHILL,
Lieut.-Col. of Engineers, U. S. A.

UNITED STATES ENGINEER OFFICE,
P. O. Box 5346, ROOM 124, P. O. BUILDING,
BOSTON, MASS., November 2, 1886. {

Sealed proposals, in triplicate, will be received at this office until 12 o'clock, noon, of December 8, 1886, for dredging and removing from Fort Point Channel, Boston Harbor, Mass., about 60,000 cubic yards of material. For specifications, blank forms, and all information apply to the undersigned.

G. L. GILLESPIE,
Lieut.-Col. of Engineers, U. S. A.

PROPOSALS FOR DREDGING IN YORK HARBOR, MAINE.
U. S. ENGINEER OFFICE,
PORTLAND, ME., November 18, 1886. {

Sealed proposals, in triplicate, for dredging in harbor of York, Maine, will be received at this office, No. 537 Congress St., until 3 P. M., of Saturday December 4, 1886, and will be opened immediately thereafter, in the presence of such bidders as may attend.

All necessary blank forms and full information on the subject will be furnished to parties desiring to bid, on application at this office.

JARED A. SMITH,
Major of Engineers.

Proposals.

IMPROVING THE CHANNEL BETWEEN STATEN ISLAND
AND NEW JERSEY.

ENGINEER OFFICE, U. S. ARMY,
Room 31, Army Building, cor. Houston & Greene Sts.,
NEW YORK, November 9, 1886. {

Sealed proposals for Improving the Channel between Staten Island and New Jersey, by dredging, will be received at this office until eleven (11) o'clock on Tuesday, November 30, 1886.

Proposals must be made in triplicate. Specifications, blank forms, and instructions to bidders may be had on application at this office.

WALTER MCFARLAND,
Lieut. Col. of Engineers.

U. S. ENGINEER OFFICE,
JACKSONVILLE, FLA., Nov. 6, 1886. {

Sealed proposals, in triplicate, for the construction of jetties at the mouth of Saint John's River, Fla., will be received at this office until 12 o'clock, noon, standard time, on December 11, 1886, and will be opened immediately thereafter.

Specifications, instructions to bidders and blank forms for proposals may be obtained at this office.

W. M. BLACK,
1st Lieut. of Engineers, U. S. A.

DREDGING IN STAMFORD HARBOR, CONN.

U. S. ENGINEER OFFICE,
Room 59, Army Building, cor. Houston & Greene Sts.,
NEW YORK, November 15, 1886. {

Sealed proposals, in triplicate, for dredging in Stamford Harbor, Conn., will be received at this office until twelve (12) o'clock M., on Saturday, December 18, 1886.

Further information, specifications and forms of proposals can be obtained at this office.

D. C. HOUSTON,
Lieut. Col. of Engineers.

PROPOSALS FOR IRON BOOK-STACK, GLASS CASES,
GLASS, &C.

WAR DEPARTMENT, SURGEON GENERAL'S OFFICE,
WASHINGTON, D. C., November 20, 1886. {

Sealed proposals in duplicate, for miscellaneous material and work required in furnishing the new building for the U. S. Army Medical Museum and Library, will be received at this office until the 30th day of December, 1886, at 12 o'clock M., and opened immediately thereafter, in presence of bidders, to wit:

1.—For the construction and erection of an iron book-stack and for cast-iron file cases.

2.—For upright glass cases, for furnishing the Medical Museum, and for miscellaneous shelving.

3.—For polished plate, and for double thick cylinder glass appertaining to the above glass cases.

Drawings, specifications, general instructions to bidders and blank forms of proposals may be seen at the office of Messrs. Cluss & Schulze, Architects, Room No. 25, Corcoran Building, Washington, D. C.

The right is reserved to reject any or all bids and to increase or decrease the quantity of work proposed to be put under contract or to waive defects if it be deemed in the interest of the Government to do so.

Envelopes containing proposals should be addressed to the undersigned and endorsed "Proposals for material and work, etc., for Army Medical Museum and Library." J. H. BAXTER, Acting Surgeon General, U. S. Army.

LAYING brick-work on the buildings of the Duerber Watch Manufacturing Company's factories, Canton, O. Until December 11. Weary & Kramer, Architects, Akron, O. Address John C. Duerber, Canton, O.

LEVEE WORK in the Mississippi, Yazoo Delta Levee District. Until December 6. Estimate 400,000 cubic yards. Address Capt. Smith S. Leach, U. S. Engineers, Memphis, Tenn.

CONSTRUCTING CANAL WALL. Until December 8. 9,000 cubic yards for Louisville and Portland Canal. Address Major Amos Stickney, U. S. Engineers, Louisville, Ky.

BUILDING 8-room school building. Until December 7. Plans by W. R. Brown, architect, 283 Broadway, Cincinnati, O. Address W. R. Brown.

DREDGING in Superior Bay and Saint Louis Bay, Wis. Until December 13. Address Capt. James B. Quinn, U. S. A., Duluth, Minn.

DREDGING in harbor of Grand Marais, Minn. Until December 13. Address Capt. James B. Irwin, U. S. A., Duluth, Minn.

IMPROVEMENT of River Don, Toronto, Can. Until November 30. Includes straightening river, dredging, piling, bridging, etc. Plans at office of City Engineer. Address William Carlyle, Chairman of Board of Works, Toronto, Ont.

Proposals.

BRICK PAVING on Hampshire Street, Quincy, Ill. Until December 1. Address Board of Public Works, Charles de Lescluze, Secretary.

STEAM-BOILER for U. S. Steamer "Arbutus." Until December 18. Address Major W. H. Heuer, U. S. Engineers, New Orleans, La.

QUARTERMASTERS' STORES. Until December 9. Address Lieut. Col. Henry C. Hodges, D. Q. M. G., U. S. A., Houston and Greene Streets, New York City.

SUPPLYING STATIONERY, drawing materials, and office supplies. Until December 20. Address Captain F. A. Mahan, U. S. Engineers, Buffalo, N. Y.

DREDGING at specified places in North and East Rivers, New York. Until December 1. Address Department of Docks, Pier A, North River, New York.

ESTIMATES for printing pamphlets, society proceedings, books, etc., furnished by

THE SANITARY ENGINEER PRESS

140 William Street, New York.

Employment Wanted.

THE SANITARY ENGINEER makes no charge for advertisements of the following classes seeking situations: Persons employed by Architects, Civil Engineers, Plumbers, and Steam-Fitting firms. Space for which no charge is made is limited to five lines. Additional space is charged for at rate of 20 cents per line. Employers advertising for help are charged 20 cents per line, about seven words to the line. Copy must reach us by Tuesday noon for current week's issue.

Professional.

A GRADUATE of a scientific school wishes to engage with an engineer. The object being experience rather than amount of wages. Address W. Payne, 7 Sixth Avenue, N. Y.

A GRADUATE of the Rensselaer Polytechnic Institute of Troy, New York, class of '86, desires employment in his profession. Hydraulic and Sanitary Engineering preferred. Address S. B. A., care THE SANITARY ENGINEER AND CONSTRUCTION RECORD.

A POSITION by a graduate of the Rensselaer Polytechnic Institute, on some engineering work, hydraulic or sanitary engineering. Address O. Z., care THE SANITARY ENGINEER AND CONSTRUCTION RECORD.

POSITION wanted by expert draughtsman and surveyor who has had considerable experience on city and other work. Lettering and topographical map work a specialty; short-hand writer. Address "Grapho," care of W. Wrightington, 28 Liberty Street, N. Y.

A POSITION as architect, confidential clerk, or manager, to a speculative builder, or a firm that is always building; excellent testimonials. Address M. H. H., care THE SANITARY ENGINEER.

ENGAGEMENT by engineer of many years' experience in making estimates, plans and specifications, and setting work for Steam Warming and Ventilation. Thoroughly understands Automatic Sprinkler work for fire protection in all its details, both wet and dry systems. Address J., care THE SANITARY ENGINEER.

Mechanical.

FIRST-CLASS plumber would like a situation, steady work. City or country. Has ten years' experience. J. J. Smith, 342 E. 21st St., City.

A FIRST-CLASS plumber and fitter would like to secure a winter's work or steady work. Either South or West preferred. Address E. Usher, Plumber 413 East 115th St., N. Y. City.

PERSONAL.

PRESIDENT CLEVELAND has appointed Surgeon John Moore, U. S. A., now stationed at San Francisco, to be Surgeon-General of the Army.

SURGEON WALLACE H. BOLAN, U. S. A., at Tagus Military Home, Maine, died there November 22.



CONSTRUCTION.

WATER AND SEWERAGE.

WATER-WORKS WANTED.—The Committee on Water-Works of Paris, Tex.—viz., A. Cate, S. E. Clement, and P. H. Allen—ask for proposals for building water-works, until December 10. The bids are to be accompanied with plans in detail and full specifications, showing exactly of what the works are to consist, and no proposal will be entertained which does not cover an entire, complete, and efficient system. The contractor will be required to enter into bond for the faithful performance of the contract, should it be awarded to him, in the sum of \$50,000. And the contractor will also be required to give a guarantee of \$10,000 that the water-supply shall be ample for all the needs of the city for a period of one year; also the water be pure, good, and soft. Proposals may be addressed to A. Cate, Chairman Water-Works Committee. Each bid must be accompanied by a certified check for \$2,500.

WATER-WORKS—On November 18 the Village Fire Corporation of Dover and Foxcroft, Me., appointed a committee to make a contract with some responsible parties for furnishing a system of water-works. A contract has been made with the Dover and Foxcroft Water Company for thirty hydrants. The system involves building a new dam and the development of an extensive water-power.

PUNXSUTAWNEY, PA.—A system of water-works is contemplated. D. W. Robinson and John B. Bair are interested.

BELMONT, MASS.—A system of water-works will be erected. F. Dodge, J. S. Kendall, J. H. Fletcher, and H. H. Baldwin are interested.

WATER-WORKS are to be erected at Pleasant Hill, Mo.

COLUMBUS, O.—The Water-Works Trustees on November 15 decided to establish an auxiliary pumping-station near Eighth Street and Mount Vernon Avenue, and Secretary Williams was directed to advertise for proposals or a site.

CAMDEN, MO., has voted to take the water of the Camden and Rockland Water-Company, providing the company will have their pipes in by June, 1887.

WATER-WORKS are to be built at Bellevue, Ky.

DALTON, GEO.—On October 30, Dalton had a city election on the question of water-supply, a majority of votes being cast in favor of water-works. Bonds will be issued, and the works will be constructed.

WATERVILLE, N. Y.—A preliminary survey has just been completed for water-works, gravity system, and it is expected that the matter will be brought before the people of the village for action in two or three weeks. The president of the corporation is A. R. Eastman.

WINDSOR, VT.—A system of water-works is contemplated.

HARPER, KAN.—With reference to the recently incorporated Harper Water Company we learn that C. W. Hill, of Wellington, Kan., has the contract for building the works and is pushing the construction as rapidly as possible.

NEWPORT AND COVINGTON, KY.—We are informed that the statement that Newport, Ky., is going to construct or enlarge its water-works is a mistake. The city's works have been in operation since 1873, and there is no expectation of enlargement or extension in the near future. Covington, however, neighbor to Newport, has authority to build a reservoir, machinery, etc., estimated to cost \$60,000.

LEBANON, N. H.—In reference to the proposed water-supply of this place we learn that the Lebanon Centre Village Fire Precinct has under consideration the supply of the precinct with water for fire and domestic purposes. A committee has been appointed to make investigation as to sources of water-supply, cost, etc. Final action cannot be taken at present. Mr. Charles A. Downs is the town clerk.

ATLANTA, GEO.—The Water-Works Commission has recommended to the General Council the making of a contract with the Newark Filtering Company to erect plant for delivering 3,000,000 gallons of filtered water daily at \$54,875, the work to be completed in four months. General Council has referred the matter to the Water-Works and Finance Committees. On the 18th inst., the Water-Works Committee brought in a favorable report, and the contract with the Newark Filtering Company was closed for the sum of \$54,875.

ALTOONA, PA.—It is said that Council will soon consider the question of an increased supply of water, involving the purchase of a quantity of new water-pipe.

NEW HAVEN, CONN.—A few issues since we reported that New Haven was considering the extension of its water-service. On November 17, A. C. Hendrick, Chief of the Fire Department, reported on the matter to the Water Committee, recommending the laying of 38,050 feet of new water-mains, and the renewal of 76,750 feet of old mains. He expressed the hope that the Water Committee would take action to require the New Haven Water Company to carry out the necessary works.

VICKSBURG, MISS.—On the 17th inst., the Mayor and Aldermanic Committee agreed on a contract with Samuel R. Bullock & Co., of New York City, for the construction of water-works, the work to be commenced in sixty days and completed in eighteen months, the city to be supplied with eighty hydrants at a cost of \$65 annually, each additional hydrant up to one hundred to cost the same amount, and all over that number to cost \$50 each, all municipal buildings to be free of cost.

BATON ROUGE, LA.—The City Council is negotiating with Mr. Raymond, of Galena, Ill., relative to the establishment of water-works in this city.

THE Osage City Water Company, New York City, N. Y., has been incorporated. Thomas J. McKee, 338 Broome Street, and others, incorporators.

THE Miners Mills Water Company, Miners Mills, Pa., has been incorporated. Capital stock, \$5,000. Treasurer, H. A. Fuller, of Wilkesbarre.

BENNINGTON, VT.—A system of water-works will be built.

BOSTON, MASS.—The State Board of Health have submitted to them for their approval, as required by a recent law, plans for proposed sewerage system and water-works for the following towns: Water-works for Bradford, sewerage for Winthrop, Medfield, Bradford, Stonehaven, and Orange. Vitrified pipe-sewers are contemplated in each case.

RALEIGH, N. C.—In our issue of November 13 we noted the recommendation of the Academy of Medicine that the number of hydrants in the proposed contract with the National Water-Works Construction Company of Dayton, O., be increased from 80 to 120. The contract has now been made between the city and the company, and by it the

supply is to be derived from Walnut Creek, near the Rhamkette Road. A reservoir or cistern is to be constructed, two duplex compound condensing pumping-engines, with a daily capacity of 2,000,000 gallons, are to be erected, with steam-power, and two pumps of equal capacity to be driven by water-power. Hyatt fitters are to be erected, and there will be 120 hydrants. The franchise runs for twenty years, the city paying for 120 hydrants \$4,800 annually, additional hydrants \$40 each per year on extensions of mains, and \$25 per year for additional hydrants on the original lines of mains. Water is to be furnished to private consumers at a tariff fixed in the contracting ordinance. A stand-pipe of iron or steel, capacity 500,000 gallons, is to be built. The water-works are estimated to cost about \$150,000. Work will begin December 1, and will be completed about July 1, 1887.

FAR ROCKAWAY, LONG ISLAND.—On the 17th inst., the Queens County Board of Supervisors annulled the contract given to the Queens County Water Company last July to furnish water to this village. It is said the company has expended a large sum in laying mains. The contract was that Far Rockaway should pay the company \$2,000 per year for water for fire purposes.

BAR HARBOR, ME.—Mr. E. W. Bowditch, C. E., of Boston and New York, has prepared plans for the sewerage of this place for an estimated population of 50,000. An appropriation of \$50,000 has been made for the construction of the first section of the work. The sewers are to be of vitrified pipe, of from 6 to 24 inches in diameter. Work to be finished by June, 1887.

SOUTH BEND, IND.—On November 18, the eleven new artesian wells were connected with the reservoir and the reservoir filled. The flow from the wells is estimated at 3,000 gallons per minute. The water-works are in charge of Superintendent Abbott.

MILWAUKEE, WIS.—There have been 12 miles of heavy cast-iron water-pipe laid in Milwaukee at an expense of \$195,000. On streets where there was no water-pipe, the cost was \$38,588.09 and the benefited property will be assessed at the rate of 52 cents per foot. The balance of the pipe was laid in streets where there was a water-pipe before, but was put in for additional supply for the west side.

GAS, STEAM, BUILDINGS, ETC.

GAS PLANT.—The Standard Gas-Light Company of New York City will increase its capital stock to \$10,000,000, making large additions to works and mains. New works will be built at the foot of East 115th Street, and wrought-iron mains will be used. Gas will be delivered into the mains under great pressures, with regulating devices to reduce the pressure to the consumers.

GAS MAIN.—The Northwestern Pipe-Line Company, E. M. Brown, of Fostoria, O., agent, is considering the laying of a main from the Toledo main to Perrysburg, to supply natural-gas to the latter town.

NEW GAS COMPANY.—Samuel J. Anthony, George W. Wilson, and associates, petition the Mayor and Common Council of Jacksonville, Fla., for permission to open streets and lay mains to supply gas.

GAS COMPANY.—W. N. Ewing and W. S. Waller are before the Kansas City Aldermen, with a request for authority to open streets, and lay gas-mains for the supply of natural or artificial gas.

PHILADELPHIA GAS-WORKS.—The Finance Committee of Councils has prepared an ordinance for leasing the works, which provides that the lessees shall pay one-half the net profits yearly to the city, the rent, however, never to fall below \$1,000,000 per annum; that the lessees shall light the present number of street-lamps and public buildings without charge; shall expend \$3,000,000 in improvements within five years; and that the price of gas shall never exceed \$1.50 per 1,000 cubic feet. On the 18th of November Common Council, after considerable debate, postponed definite action until November 30.

MILWAUKEE, WIS.—At the next meeting of the Legislature a resolution will be presented to authorize the city to issue \$250,000 worth of bonds to obtain money for the erection of a fire-proof building for the Public Museum, Library, and School Board offices, to stand on the site of the vacated cattle market.

CREMATORY.—The directors of Forest Home Cemetery, Milwaukee, Wis., have agreed to allow the erection of a building for pur-

poses of cremation at the cemetery, but the details have not yet been arranged. The building, it is estimated, will not cost more than \$10,000.

FLATBUSH ASYLUM.—The Board of Supervisors have received the report of Architect R. B. Eastman, and Sanitary Engineer James J. Powers on the improvement of the Insane Asylum Building at Flatbush, L. I., which recommends an expenditure of about \$50,000. Their plan contemplates the erection of six extensions for plumbing fixtures.

RAILROADS AND CANALS.

NEW RAILROAD.—Recently incorporated is the Port Jervis, Monticello, and New York Railroad Company, to build a road from Port Jervis to the New York, Ontario, and Western Railroad forty-five miles. The trustees are: Obadiah P. Howell, Peter E. Far, Henry R. Low, Charles Clark, Russell I. Low, Benjamin Low, Wade Buckley, William H. Neapass, William Norris, William J. Groo, William B. Royce, Alfred Gilman, M. D. Stivers.

THE Western Hills Rapid Transit Company of Cincinnati, to build a railroad to Cheviot, sends articles of incorporation to the Secretary of State.

THE Elgin, Ill., City Street Railway Company has been incorporated to build street railroads. Incorporators, G. T. Lord, R. P. Jackman, William Grote, and others.

MONTREAL.—The question of widening and heightening the old railroad bridge across the Rideau River from Ottawa, Ont., to Edinburg, will be referred by Mr. Shaughnessy, of the Canadian Pacific Railway, to an outside engineer.

BRIDGE IMPROVEMENT.—The Trustees of the Brooklyn Bridge have instructed Superintendent Martin to have plans made showing an extension and passage over the south roadway of the New York entrance.

BIDS OPENED.

POUGHKEEPSIE, N. Y.—The following bids for the erection of four buildings for the Hudson River State Hospital were received by the Building Committee Board of Managers, November 20; Powers & O'Reilly, Poughkeepsie, \$112,000; Millett Titus, Poughkeepsie, \$119,000; A. F. Chapman, Poughkeepsie, \$118,000; Elias Spruss, Poughkeepsie, \$121,476. Plans are by Frederick C. Withers, architect, of New York. It was a condition of the proposals that no bid over \$120,000 should be considered.

OVERLIN, O.—Bids for furnishing and laying water-pipe, chiefly vitrified, with gates, manholes, etc., and building reservoir, well, and pump-house, were opened by the Water-Works Trustees, November 15. The estimates were on 21,000 lineal feet of 10-inch and 6,000 lineal feet of 8-inch vitrified pipe, and 25 10-inch and 10 8-inch T's; also 1,150 feet of 10-inch and 50 feet of 8-inch iron-pipe, and 6 10-inch and 4 8-inch water gates; average covering to the pipe about 5 feet. There is a storage reservoir 100'x155' on top and 66'x100' on the bottom, a well 30' in diameter and 20' deep, and a pump-house 30'x50', brick walls and slate roof, smoke-stack 8' square at base and 75' high. On the pipe alone the bidders were the Columbus Sewer-Pipe Co., Columbus, O., the American Sewer-Pipe Co., Columbus, O., the American Sewer-Pipe Co., Akron, O., Carter & Hatch, Oberlin, O., and Francey's Sons, Toronto, O. All bid the same figures (except Francey's Sons)—viz., 21c. for 10" pipe, 14c. for 8" pipe vitrified; T's 21c. for 10" and 14c. for 8". Francey's Sons bid on 8" 15c., and on T's 84c. and 56c.

On the pipe-line complete the bidders were:

Wm. H. Myers & Son, Hillsdale, Mich.	\$19,842.00
Doerzback & Decker, Sandusky and Oberlin.	19,100.00
Kerr & Schandler, Cleveland.	18,990.00
E. J. Green & Son, Buffalo.	16,423.25
W. M. Chisholm, East Liverpool.	14,721.30
Clements Brothers, Cleveland.	14,534.00
Benjamin Thompson, Urbana.	13,075.00
M. Callan & Co., Sandusky.	12,475.75
A. L. Holmes, Grand Haven, Mich.	12,195.50
House, Otis & Arnold, Norwalk.	11,998.48
W. H. Crook, Massillon.	11,950.00
Phillip Sullivan, Fremont.	11,937.80

On reservoir and well:

W. H. Myers & Son, Brick	\$1,997.00
" " " Stone	1,997.00
Doerzback and Decker, Brick	1,279.00
" " " Stone	1,143.00
Kerr & Schandler	1,280.00
W. M. Chisholm	1,300.00
Benjamin Thompson	1,460.00
A. L. Holmes	2,077.00

M. Callan & Co., Brick	1,077.50
" " " Stone	822.00
Phillip Sullivan, Stone	852.50
" " " Brick	912.50

On pump-house:

Water and Gas Construction Co., Pittsburg.	\$3,500.00
Doerzback & Decker	3,300.00
Wm. H. Myers & Son	2,990.00
Benjamin Thompson	2,090.00

The lowest aggregate bid is about \$15,800. Bids for machinery will be received hereafter.

CINCINNATI, O.—The Commissioners of Hamilton County opened proposals on November 20 for freezing and refrigerating machinery in connection with the county morgue, Forbush and Green, architects. The bids were as follows: Blymyer Mfg. Co., De Coppel Absorption Ice Machine, \$1,500; Scranton Mfg. Co., Rochester, N. Y., Lightfoot Dry Air Refrigerator, \$4,030; David Boyle, Chicago, Ill., Ice Machine, \$4,200; Pickett Ice Machine, Love & Co., Cincinnati, O., \$4,427; Duplex Ice Machine, McGowan Pump Co., Cincinnati, O., \$4,800; Champion Cold Storage and Ice Co., Dugan & Co., Covington, Ky., \$5,600; contract not awarded.

BROOKLYN, GARBAGE.—The contract for removing garbage for the term of five years has been awarded to Henry Berau. We have already published the bids.

ELGIN, ILL.—A. Magnus has received the contract for mason work, and Joseph Pavey the contract for carpenter work, on the new opera-house. The cost is put at about \$30,000.

DOVER, N. H.—The contract for widening and deepening the Cocheco River has been awarded to Thomas Simmonds, of Leominster, Mass. The bids were given in our last issue.

GOVERNMENT WORK.

CHELSEA, MASS., HOSPITAL.—The bids for furnishing steam-heating apparatus for the Marine Hospital, at Chelsea, have been rejected, and the work deferred until next spring.

LEVEE IMPROVEMENT.—On November 17, the Board of U. S. Engineers, at Memphis, Tenn., made the final allotment for levees as follows: \$12,000 to the Yazoo front; to the Lake Providence reach \$11,100; to the Tennessee Basin front in Louisiana \$91,920.86, that is from Arkansas City to the Louisiana State line, provided the citizens of that district contract for an equal amount before this \$94,920.86 can be used.

POST-OFFICE, ETC., AUGUSTA, ME.—Synopsis of bids for building materials opened November 20, 1886:

Bidders.	Granite.	Bricks.	Cement per lb.	Time to deliver.				
				.....	Six months.	August 1, 1887.	April 1, 1887.	After April 1, 1887.
Leigh & Wingate	\$1.48	.....	.....	.....	.....	No date given.
Arche & Agostini	No date given.
Isaac S. Bangs	No date given.
Hallowell Granite	No date given.
Works	No date given.
Morton & Purington	No date given.
Fuller & Cony	No date given.

SYNOPSIS of bids opened at Treasury Department November 15, 1886, for two first-class light-ships (steel), one to be delivered at Edgemore Buoy, Delaware, and the other at Portsmouth Buoy Depot, Va.: Houston & Woodbridge, Linwood, Pa., \$48,000 and \$49,000; James Bigler, Newburg, N. Y., \$74,750 and \$74,750; John H. Dialogue, Camden, N. J., \$57,200 and \$57,400; H. A. Ramsey & Son, Baltimore, Md., \$56,900 and \$56,700; Columbia Iron-Works, Baltimore, Md., \$57,470 and \$57,470; Pusey & Jones Company, Wilmington, Del., \$54,700 and \$54,860.

COURT-HOUSE, ETC., JEFFERSON CITY, MO.—Synopsis of bids for iron stairs opened November 23, 1886: Manley & Cooper Manu-

NEW CRUISERS.—Synopsis of bids opened for steel cruisers and gun-boats for the Navy, at office of Secretary of Navy, November 24 :

Bidders.	Cruiser No. 1, 4,000 tons.	Cruiser No. 2, 3,700 tons.	Cruiser No. 3, 4,400 tons.	Gunboat No. 1, 1,700 tons.	Gunboat No. 2, 870 tons.
Harlan & Hollingsworth, Wilmington, Del.....	\$1,224,000	\$1,140,000	\$1,452,000	.....	.....
Union Iron-Works of San Francisco, Cal.....	1,132,000	1,017,500	1,348,000	.....	.....
Camp & Sons, Phila delphia, Pa. ....	.....	1,050,000 and \$1,065,000, with contrac- tor's design for the machinery.	1,348,000	\$450,000	.. ..
Charles Reider & Sons, of Baltimore, Md.....	.....	.....	.....	\$495,000 and for the machinery only \$185,000	\$935,000 machinery only.
Columbia Iron-Works, Bal- timore, Md.....	.....	.....	.....	499,750	\$247,000
H. A. Ramsey & Son, Baltimore, Md.....	.....	.. ..	.....	.....	\$9,000 machinery only.

IMPROVEMENT OF WILMINGTON HARBOR, CAL.—Abstract of bids for dredging called for by advertisement of October 8, 1886, by Colonel G. H. Mendell, Corps of Engineers, U. S. A., and opened November 8, 1886, at 12 m., by Colonel Mendell: Alexey W. Von Schmidt, 29.8c. per cubic yard; Pacific Coast Dredging and Reclamation Company, 50c.; Henry H. Lynch, 57.2c.

Building Intelligence.

We solicit from each and every one of our readers information relating to projected buildings in their locality, and should be glad to receive newspaper clippings and other items of interest.

ABBREVIATIONS.—*b* s, brown stone; *br*, brick; *br st*, brick store; *bs dwell*, brown-stone dwelling; *apart house*, apartment-house; *ten*, tenement; *e*, each; *s*, owner; *a*, architect; *b*, builder; *fr*, frame.

NEW YORK CITY.

144th st, s s, 210 e 8th av, 7 3-story br tens; cost, ea, \$15,000; o, Mary E Carlin, 143d st, bet 7th and 8th avs; a, W P Anderson; b, P J O'Brien.

BUILDING INTELLIGENCE.

Gansevoort, n e cor Washington st, 3 br flats; cost, \$50,000; o, John J. Astor; a, James W. Cole; b, John Jordan.

ALTERATIONS, NEW YORK.

72d st, s e cor 2d av, dwell altered to flat;
cost, \$8,500; o, Maurice Moore, 43 New st; a,
Marshall & Walter; b, John Maxwell.

BROOKLYN.

Patchen av, n w cor Marion st, 2 3-story fr
ens; cost, \$5,000; o, a and b, H Grasman, 364
Vernon av.

BUILDING INTELLIGENCE.

S s Macon st, 215 ft e Lewis av, 1 st dwell,
cost, \$6,000: o. a. and b G. McKeechie

MISCELLANEOUS.

ALBANY, N. Y.—Work is commenced on the Lathrop Memorial Building by Mrs. Leland Stanford on Washington av; Ogden & Wright, architects; Harvey Joung, builder.

BOSTON, MASS.—Plans now being prepared for the enlarging of the Boston State House contemplate the closing of Mt. Vernon st from its intersection with Beacon st to Temple st, and the taking of all the estates between Mt. Vernon and Bowdoin sts for the eastern section of the remodeled building. For a corresponding wing on the west side of the present State House it is proposed to take all the property on Beacon st to and including the estate of the late James M. Beebe, and from that point running in a straight line back to Mt. Vernon st.

Saunders st, 2 fr and br dwells; cost, \$14,000; o, Henry Baldwin; b, J A Vickery & Co.

BALTIMORE, MD.—Mill and Pratt, 4-story
br warehouse; o, J R Hudgins.

BUILDING INTELLIGENCE.

BALTIMORE, MD.—McCullough and Wilson, 3 3-story br dwells; o, E J McMullen. Townsend, nr Charles, 3 3-story br dwells; o, C H Callis.

McCullough, nr Wilson, 5 3-story br dwells; o, Jos Hampson.

Architect Jackson C Gott, is preparing plans for a hotel, br and stone, 5 stories, for Messrs. E O Grimes and Wm B Thomas, to be built at Westminster, Md. Estimated cost, \$15,000.

CLEVELAND, O.—Brownell and Huron, br and br stone flat; cost, \$35,000; o, Col John Hay; a, George F Hammond; b, John Grant.

Euclid av, br and stone stores and offices; cost, \$45,000; o and a, same as above; b, H Lindhorst.

Wilson, cor Scovill, br and terra cotta res; cost, \$25,000; o, J H Van Dorn; a, E E Sherwood; b, A K Quayle.

CINCINNATI, O.—N w cor Walnut and Water, 5-story br bldg; cost, \$17,500; o, Jas Gilmore; b, W H Stewart & Son.

CHICAGO, ILL.—315-17 W Lake, br st and dwell; cost, \$10,000; o, B Harris; a, Reh-woldt.

3335-37 S Park av, br dwell; cost, \$10,000; o, H R Wilson.

683 W Lake, br st and dwell; cost, \$10,000; o, P D O'Neill.

312-18 Marshfield av, br dwell; cost, \$17,000; o, Thomas Clark.

931-43 Spaulding, br dwell; cost, \$20,000; o, D F Anderson.

3414 Wabash av, br dwell; cost, \$10,000; o, W S Jones.

196 Ontario, br flats; cost, \$11,000; o, H Zimmermann & Sons.

399-405 Ontario, br dwell; cost, \$10,000; o, Chandler & Whitehouse; a, Burling & Whitehouse; b, Barney & Rodatz.

Polk and Chicago River, br office; cost, \$12,000; o, Young & Farrell.

2520-22 Calumet av, barn and engine house; cost, \$16,000; o, Ivan T. Phillips.

176 Dearborn av, br dwell; cost, \$10,000; o and a, Jno Addison.

Jackson and Ogden av, br st and dwell; cost, \$35,000; o, J B Durand; a, S M Randolph.

3336-38 Rhodes av, br dwell; cost, \$13,000; o, W P Nelson.

931-59 Spaulding av, br dwell; cost, \$20,000; o, D F Anderson.

548-54 Park av, br dwell; cost, 16,000; o W H Thomas & Son; a, H R Wilson.

320-26 Walnut, br dwell; cost, \$15,000; o, J M Wanzer.

802 W Adams, br dwell; cost, \$10,000; o, Wm J Martin.

234-44 Newberry av, br factory; cost, \$17,000; o, Mr Williams.

DENVER, COL.—17th st, Stone st car stables; cost, \$30,000; o, Denver St Car Company; a, J W Roberts; b, W Harvey.

Colfax av, double br 2-story dwell; cost, \$10,500; o, H Sweeny; a, same as above; b, J Buell.

17th and Glenarm, 3-story stone club house; cost, \$90,000; o, Denver Club; a, Peabody & Stearns; b, not let.

DETROIT, MICH.—Lincoln st, br church; cost, \$12,000; o, Belgian Catholic Society; a, Derick Bros.

702 Woodward, br dwell; cost, \$10,000; o, R H Fyfe; a, M L Smith; b, Bunting & Sigman.

506 Grand River, br dwell; cost, \$9,200; o, R A Parker; a, Henry A Apel.

70 Fremont, br dwell; cost, \$10,000; o, O W Armstrong; a, Rogers & McFarland; b, H Chandler.

64 Warren, br dwell; cost, \$10,000; o, James M Munro.

47 Cadillac Sq, br store; cost, \$14,500; o, E L Smith; a, A E French; b, M Blay & Son.

231 Fourth, br dwell; cost, \$10,000; o, W Tate; a, M L Smith; b, F. W. Claxton.

BUILDING INTELLIGENCE

KANSAS CITY, MO.—Wyoming and 9th, Metropolitan engine-house; cost, \$40,000; o, Metropolitan St Ry Co.

Grove and 9th, br res; cost, \$15,000; o, W W Arnold.

MILWAUKEE, WIS.—19th and Cedar st, dwell; cost, \$5,000; o, Mrs. Forrestal.

4th and Fowler, br warehouse; cost, \$30,000; o, Davidson & Sons.

Se cor 4th and Cedar, church; cost, \$5,000; o, African Methodist Episcopal Church Society.

PHILADELPHIA, PA.—Mount Vernon and Ridge, circular iron bldg; b Jones & Benner Co.

Howard bet Oxford and Jefferson, 1 3-story factory bldg; b David Mayher.

19th bet Wylie and Brown, addition to factory; o Keystone Watch Case Co.

Wyalusing av, bet 45th and 46th, 7 2-story dwells; b John Bateson, Jr.

1544-46 S 19th, 2 dwells; o Samuel McClellan.

Main, nr Shurs Lane, 1 2-story factory; b S. S. Keeley.

Canal Bank, n Toll Bridge, addition to factory; b S. S. Keeley.

27 N 7th a 5-story br bldg; b Rea & Riley.

Jordan, bel Wharton, 19 2-story dwells; o W. A. Brown.

39th, bet Powelton and Baring, 1 dwell; b Frank H. Vogdes.

Mountain, bet 20th and 21st, 7 dwells; o Alexander Guthrie.

3d, ab Girard av, 1 br and iron market house; b Brocklehurst & Ewing.

The Pennsylvania Warehousing and Safe Deposit Company will a warehouse on the S. & J. Welch property (Pier 34, Delaware River), 169x200 feet, 6 stories high. The President is F. R. Pemberton.

PROVIDENCE, R. I.—Cor Pearl and W Clifford, 2 fr dwells; o H. Fletcher; b B. Mason.

ST. LOUIS, MO.—10th st and Chouteau av, 2 adj br dwells; cost, \$20,000; o, G Bachtelers; b, H. Elhmann.

Helen and Howard sts., 2 adj br dwells; cost, \$6,200; o, E. W. Chiner; a, A. Mouschein.

Pine st and Cabanne av, br dwell; cost, \$12,000; o and b, J. Mahon.

Lindell av and King's Highway, br dwell; cost, \$75,000; o, J. W. Kaufman; a, E. & P. Newcomb; b, sublet.

7th and Cass, a br feed st; cost, \$7,000; o, J. Levy; a, A. Mouschein; b, sublet.

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PREFACE.

THE SANITARY ENGINEER, while devoted to Engineering, Architecture, Construction, and Sanitation, has always made a special feature of its departments of Steam and Hot-Water Heating, in which a great variety of questions has been answered and descriptions of the work in various buildings have been given. The favor with which a recent publication from this office, entitled "Plumbing and House-Drainage Problems," has been received suggested the publication of "STEAM-HEATING PROBLEMS," which, though dealing with another branch of industry, is similar in character. It consists of a selection from the pages of THE SANITARY ENGINEER of questions and answers, besides comments on various problems met with in the designing and construction of steam-heating apparatus, and descriptions of steam-heating work in notable buildings.

It is hoped that this book will prove useful to those who design, construct, and have the charge of steam-heating apparatus.

CONTENTS:

BOILERS.
On blowing off and filling boilers.
Where a test-gauge should be applied to a boiler.
Domes on boilers: whether they are necessary or not.
Expansion of water in boilers.
Cast vs. wrought iron for nozzles and magazines of house-heating boilers.
Pipe-connections to boilers.
Passing boiler-pipes through walls: how to prevent breakage by settlement.
Suffocation of workmen in boilers.
Heating-boilers. (A problem.)
A detachable boiler-lug.
Isolating-valve for steam-main of boilers.
On the effect of oil in boilers.
Iron rivets and steel boiler plates.
Proportions for rivets for boiler-plates.
Is there any danger in using water continuously in boilers?
Accident with connected boilers.
A supposed case of charring wood by steam-pipes.
Domestic boilers warmed by steam.

VALUE OF HEATING-SURFACES.
Computing the amount of radiator-surface for warming buildings by hot water.
Calculating the radiating-surface for heating buildings—the saving of double-glazed windows.
Amount of heating-surface required in hot-water apparatus boilers and in steam-apparatus boilers.
Calculating the amount of radiating-surface for a given room.
How much heating-surface will a steam-pipe of given size supply?
Coils vs. radiators and size of boiler to heat a given building.
Calculating the amount of heating-surface.
Computing the cost of steam for warming.

RADIATORS AND HEATERS.
A woman's method of regulating a radiator (covering it with a cosy).
Improper position of radiator-valves.
Hot-water radiator for private houses.
Remedying air-binding of box-coils.
How to use a stove as a hot-water heater.
"Plane" vs. "Plain" as a term as applied to outside surface of radiators.
Relative value of pipe on cast-iron heating surface.
Relative value of pipe on steam-coils.
Warming churches (plan of placing a coil in each pew).
Warming churches.

PIPING AND FITTING.
Steam-heating work—good and indifferent.
Piping adjacent buildings: pumps vs. steam-traps.
True diameters and weights of standard pipes.
Expansion of pipes of various metals.
Expansion of steam-pipes.
Advantages claimed for overhead piping.
Position of valves on steam-riser connection.
Cause of noise in steam-pipes.
One-pipe system of steam-heating.
How to heat several adjacent buildings with a single apparatus.
Patents on Mills' system of steam-heating.
Air-binding in return steam-pipes.
Air-binding in return steam-pipes, and methods to overcome it.

VENTILATION.
Size of registers to heat certain rooms.
Determining the size of hot-air flues.
Window ventilation.
Removing vapor from dye-house.
Ventilation of Cunard steamer "Umbria."
Calculating sizes of flues and registers.
On methods of removing air from between ceiling and roof of a church.

STEAM.
Economy of using exhaust steam for heating.
Heat of steam for different conditions.
Superheating steam by the use of coils.
Effect of using a small pipe for exhaust steam-heating.
Explosion of a steam-table.

CUTTING NIPPLES AND BENDING PIPES.
Cutting large nipples—large in diameter and short in length.
Cutting crooked threads.
Cutting a close nipple out of a coupling after a thread is cut.
Bending pipe.
Cutting large nipples.
Cutting various sizes of thread with a solid die.

RAISING WATER AUTOMATICALLY.
Contrivance for raising water in high buildings.
Criticism of the foregoing and description of another device for a similar purpose.

MOISTURE ON WALLS, ETC.
Cause and prevention of moisture on walls.
Effect of moisture on sensible temperature.

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Heating water in large tanks.
Heating water for large institutions and high city buildings.
Questions relating to water-tanks.
Faulty elevator-pump connections.
On heating several buildings from one source.
Coal-tar coating from water-pipe.
Filters for feeding house-boilers. Other means of clarifying water.
Testing gas-pipes for leaks and making pipe-joints.
Will boiling drinking-water purify it?
Differential rams for testing fittings and valves.
Percentage of ashes in coal.
Automatic pump-governor.
Cast-iron safe for steam-radiators.
Methods of graduating radiator service according to the weather.
Preventing fall of spray from steam-exhaust pipes.
Exhaust-condenser for preventing fall of spray from steam-exhaust pipes.
Steam-heating apparatus and plenum (ventilation) system in Kalamazoo Insane Asylum.
Heating and ventilation of a prison.
Amount of heat due to condensation of water.
Expansion-joints.
Resetting of house-heating boilers—a possible saving of fuel.
How to find the water-line of boilers and position of try-cocks.
Low-pressure hot-water system for heating buildings in England (comments by *The Sanitary Engineer*).
Steam-heating apparatus in Manhattan Company's and Merchants' Bank Building, New York.
Boilers in Manhattan Company's and Merchants' Bank Building, with extracts from specifications.
Steam-heating apparatus in Mutual Life Insurance Building on Broadway.
The setting of boilers in Tribune Building, New York.
Warming and ventilation of West Presbyterian Church, New York City.
Principles of heating-apparatus, Fine Arts Exhibition Building, Copenhagen.
Warming and ventilation of Opera House at Odens-burg, N. Y.
Systems of heating houses in Germany and Austria.
Steam-pipes under New York streets—difference between two systems adopted.
Some details of steam and ventilating apparatus used on the continent of Europe.

MISCELLANEOUS QUESTIONS.
Applying traps to gravity steam-apparatus.
Expansion of brass and iron pipe.
Connecting steam and return risers at their tops.
Power used in running hydraulic elevators.
On melting snow in the streets by steam.
Action of ashes street fillings on iron pipes.
Arrangement of steam-coils for heating oil-stills.
Converting a steam-apparatus into a hot-water apparatus and back again.
Condensation per foot of steam-main when laid under ground.
Oil in boilers from exhaust steam, and methods of prevention.

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reports of surveys and almost to the plane of a thorough treatise on water-supply examinations.

The scope of the physical examinations is shown by the statement that in the water-sheds under consideration the physical features—viz., the contour and elevation of the ground, the untillable areas, those covered with timber and those under cultivation, also the towns, villages, roads, etc.—had all been mapped. The sanitary features—viz., the distribution and amount of population residing upon the water-shed, their principal occupation, death-rate, disposal of sewage, extent and character of mills, factories, slaughter-houses, cemeteries, etc.—had also been ascertained and entered upon the maps or described.

Looking at the possibility of pollution of the water, the investigations showed that in the Blue Mountains there resides one person on every thirty acres, and in the Perkiomen, Tohickon, and Neshaminy water-sheds one person on every six acres, a population which, if distributed, is in every case too sparse to seriously affect the condition of the water draining from any of the areas. In the case of the Tohickon and Neshaminy a fortunate circumstance permits the sewage from the only two centres of population to be diverted to other water-sheds—namely, the Doylestown drainage can be carried into Mill Creek and thence to the Neshaminy below the proposed dam, and the Quakertown drainage can be carried by a short sewer into the Perkiomen Creek, if the Tohickon project is used in preference to that of the Perkiomen. This circumstance reduces the population per unit of area to less than that of the Perkiomen, and leaves it more generally distributed and less likely ever to affect the water.

Regarding the maps made it is valuable to note that the large scale to which the surveys were plotted—viz., 400 feet to one inch—the comparative accuracy of the survey, and the amount of detail contained on the map render them a valuable contribution to the survey of the State, inasmuch as they cover an area of 446 square miles in Bucks, Montgomery, and Lehigh Counties. They will not only permit of a careful location of the geological features, but facilitate the detailed study of new railroad lines and other improvements.

Extensive researches into the rainfall on the water-sheds and comparisons of the same with the annual precipitation in Philadelphia were made with much care. From the Philadelphia records the conclusion is drawn that a minimum rainfall of 76 per cent. of the mean annual rain may be expected at certain intervals of years.

Then taking the rainfall at Philadelphia and that at a number of stations in the water-sheds examined for the years during which the survey has been in progress, a ratio was established for each water-shed and from that a minimum for each water-shed. It must be confessed that this part of the report appears to be composed of very elaborate reasoning on insufficient data and ungrounded assumptions.

From the extensive system of gaugings of the flow of the various streams and the comparisons of their results with those obtained by the gaugings of the Croton and Sudbury Rivers data of interest are obtained for the student of this branch of hydraulic engineering.

It is noticed that the least summer flow is generally found in those streams that also have the greatest winter flow. The Perkiomen at Frederic has the largest summer flow per square mile of any of the streams observed, which, no doubt, is due to the mountainous and wooded region near its head. The variation in the flow during the different months is very great. It is apparently even greater here than in the Croton and Sudbury Rivers. The Perkiomen has a smaller maximum and larger minimum flow than the Tohickon and Neshaminy Creeks, due to the somewhat greater rainfall in the higher altitudes of the Perkiomen water-shed and partly to the greater area of wooded territory which tends to retain the water and deliver it into the streams more gradually; and it is also stated that an examination shows again that our creeks have a larger proportion of flow in the winter months and are drier in summer than the Massachusetts and New York rivers. This is due partly to the lower latitude of the former permitting the accumulation of less snow, but mainly to the larger proportion of cultivated and open ground in our water-sheds, which allows the rain-water to run off more rapidly.

Regarding storage-reservoirs, which are necessary to utilize the mean annual stream discharge, the report says:

"The natural facilities for impounding water in most of the valleys are quite good and the expense is therefore not excessive. The cost of the principal reservoirs, for instance, is as follows:

Tohickon Valley, at Haycock, about 18,000 mil. gals. at \$82.53 per M.
Perkiomen Valley, at Green Lane, about 12,000 mil. gals. at \$93.88 per M.
E. Swamp Creek Valley, at Millville, about 8,000 mil. gals. at \$103.13 per M.
W. Swamp Creek Valley, above Ziegler'sville, about 12,000 mil. gals. at \$76.21 per M.
N. E. Branch, at Lederachville, about 15,000 mil. gals. at \$100.20 per M."

The average cost of the storage-basins in the Croton Valley is given as \$200 per million gallons and the estimated cost of the large Croton reservoir about to be built as \$125 per million gallons.

In relation to another important matter, the ratio of the storage capacity and the demand to the total yield the following judicious statement is made:

"The quantity of water which must be impounded in a given water-shed increases in a greater ratio than the supply to be daily furnished. As the latter becomes greater in proportion, not only a larger quantity of stored water must be drawn, but it must be drawn for a longer time, because the period when the stream carries a deficient amount becomes longer.

"In the Sudbury water-shed, in order to furnish 0,000,000 gallons daily, a storage capacity is required of 2,900,000,000 cubic feet, and for 40,000,000 gallons daily a capacity of only 450,000,000 cubic feet is needed. The reservoir capacity is in a ratio of $6\frac{1}{2}$ to 1, while the daily supplies are in a ratio of $1\frac{1}{4}$ to 1.

"In the Croton water-shed, in order to furnish 100,000,000 gallons daily, a storage capacity of 1,200,000,000 cubic feet is required, for 200,000,000 gallons a capacity of 4,000,000,000 cubic feet, and for 300,000,000 gallons daily a capacity of 7,300,000,000 cubic feet. The reservoir capacity is in a ratio of 6 to $3\frac{1}{2}$ to 1, while the daily supply is in the ratio of 3 to 2 to 1.

"It is evident that the expense of storage becomes comparatively great when the amount of water used approaches the total flow of the streams."

As illustrating the thoroughness of the work undertaken by Mr. Hering, the following is of interest:

"At the beginning of the investigation it appeared probable that a very close discrimination might be required between the different water-sheds because their general character was quite similar. Besides making a careful topographical survey and gauging of the rainfall and stream flow at as many points as possible, it was thought desirable also to have at hand whatever data might otherwise throw light on the relation between the rain and the stream flow from the separate areas. It was therefore concluded to abstract the following data from the topographical maps, which would assist in this direction. The areas were divided into vertical sections, the first comprising all the territory between 0 and 200 feet elevation, the second that between 200 and 400 feet elevation, and so on, each section being bounded by a 200-foot contour line. This division would facilitate the making of a mean profile of the areas and of their respective surface characteristics, with which a better interpretation of the above relation might be obtained. The surface characteristics noted were the areas of the ground slope less than 2 feet per 100, between 2 feet and 20 feet per 100 and over 20 feet per 100; also the areas of the roads, of the cultivated soil, of the wooded and untillable ground, and of the swamps and meadows."

As a rule generalizations regarding principles are out of place in a report of this kind, but when a good deal of sound doctrine is compressed in a small space, as in the following paragraph, one can hardly find fault:

"Among determining elements, also, the following should be considered: The larger the reservoir the better will be the quality of the water. A large surface facilitates wave action and thereby a better aeration of the water, which is quite essential where the creek-water to be stored comes from agricultural areas. Large and long reservoirs act also as excellent settling-basins, because the slow velocity of the water passing through them allows the suspended particles to settle. Deep reservoirs, further, keep the water cooler, cause less evaporation, and retard the growth of organic matter. Steep banks allow a minimum amount of surface to be alternately wet and dry, consequently to develop low vegetation, which is injurious to health. The lower down the reservoirs are in the valley the more rapidly will rains fill them after having been drawn down.

"The geological structure of the valley sometimes has a great effect on its ability to store water. If the stratification across the valley is synclinal it will favor the retention of the water, while if it is anti-clinal it will facilitate leak-

age. Fissured trap-rock, which forms the dyke at Schwenks ville, through which the Perkiomen has worn its path, would allow water to escape more readily than compact rocks. The question of percolation has, however, not been considered a serious one. The water from all the creeks is more or less muddy after rains, and the fine silt will in a short time close the pores of the porous materials and practically make them water-tight."

The names of all the persons who assisted in the surveys and examinations or rendered information are appended to the report, and there are four maps and thirty-seven tabular statements.

GENERAL CONCLUSIONS.

It remains now briefly to recapitulate the final conclusions that have been arrived at from the examinations described above. In making these investigations it has been taken for granted from the outset that the water from any point in the Schuylkill River and from any point in the Delaware River below Trenton will not be of a sufficiently good quality to furnish a future supply for the city, although the fact has been admitted that at present the Delaware water at Lardner's Point, within the city limits, is not only fairly good, but is likely to remain so for some time.

In looking about for an improved supply every practicable scheme was considered. No success could be expected from a supply by artesian or driven wells in this locality, nor would filtering or purifying the water of the Schuylkill or lower Delaware give permanent satisfaction. The only schemes worth investigating were those which bring to the city the water of running streams in the Schuylkill, Delaware, or Lehigh water-sheds.

It required but little thought to see that the water from the streams north of the Blue Mountains would be the best available in quality, not only now, but for the indefinite future, and that this region would therefore have to be the ultimate source of water-supply for Philadelphia, and probably also for other cities lying between the mountains and the seaboard.

To obtain an intelligent opinion on the cost of such a supply surveys and examinations were made which showed that, inasmuch as water of good quality can be secured at a less expense from nearer localities, it is not advisable at once to go to the Blue Mountains.

In adopting a scheme for an earlier future this ultimate source, however, should be considered, so that the aqueduct now constructed could be available for the final source of supply. The quantity of water which it was thought best to calculate for at present was at least 200,000,000 gallons per day, or more than double the present consumption. The elevation at which the water should be delivered was fixed at about 170 feet above datum (the height of the present basin at Wentz's farm and the proposed basin at Cambria), because it gives the most favorable distribution for the city.

The streams offering a good water-supply nearer than the Blue Mountains are the Perkiomen Creek, a tributary of the Schuylkill River, the Tohickon and Neshaminy Creeks, tributaries of the Delaware River, and the Delaware River itself above Trenton. In point of quality the water of the latter has been found to be the best, that of the upper Perkiomen and Tohickon Creeks comes next in quality, and that of the Neshaminy and lower Perkiomen Creeks is least good.

An estimate of the cost of obtaining Delaware water alone indicates that above Lardner's Point the most economical scheme is to bring it from Point Pleasant, as stated in the last report, because the river has quite a descent near this place, which materially reduces the height of pumping as compared with points lower down the river, such as Lumberville, New Hope, and Yardleyville. Another advantage gained by this sudden descent is the water-power which can be developed to furnish a daily supply of 120,000,000 gallons during the dry season.

The cost of the aqueduct pumping plant and capitalized cost of pumping amounts to \$19,622,543, if 210,000,000 gallons of water daily are pumped by steam, and to \$15,475,262 if only 120,000,000 gallons are pumped by water and the remainder by steam.

Purely gravity supplies without pumping can be obtained either from the Perkiomen Creek or from the Tohickon and Neshaminy Creeks combined. The latter project cannot be made to furnish a daily supply of over 156,000,000 gallons in years of minimum rainfall. While the water furnished by the Tohickon and upper Perkiomen Creeks is good, that which is taken from the Neshaminy and lower Perkiomen, as already stated, will be of much inferior

quality. Neither of these purely gravity schemes would therefore be quite satisfactory.

The cost of procuring a supply from the Perkiomen Creek is \$13,674,493, and from the Tohickon and Neshaminy Creeks together \$13,846,662.

Finally, a combined gravity and pumping scheme is possible by procuring water from the Tohickon Creek and from the Delaware River at Point Pleasant. The former can furnish on the average between 90,000,000 and 100,000,000 gallons per day by gravity; in minimum years only 30,000,000 gallons can be depended upon. The Delaware River, as we have seen, can furnish 120,000,000 gallons by water-power. Both the Tohickon and Delaware waters have been found not only to be of good quality, but much better than the waters of the Neshaminy and particularly of the lower Perkiomen Creeks.

The cost of this scheme is \$12,625,941 if the water-power is utilized, and \$17,717,025 if steam-power is used.

It is therefore clear that the best and most economical project to supply the city of Philadelphia with water is to bring to it the Tohickon water by gravity and to pump from the Delaware River at Point Pleasant by water-power.

In order to perceive the relative values of the different schemes with still more distinctness, I have made three estimates, one for completely filling the aqueduct, one for furnishing 150,000,000 gallons, and one for only 90,000,000 gallons per day.

To supply the latter quantity of water from the Perkiomen Creek requires an expenditure of \$10,495,000. In bringing 90,000,000 gallons daily from the Delaware water-shed it is found that the Neshaminy Creek alone could furnish this amount, except during years of minimum rainfall, at a total expense of \$7,875,000. The Tohickon Creek, also, could furnish a quantity up to 90,000,000 gallons, except during very dry years, at a cost of \$10,008,000. If the Delaware water at Point Pleasant is used the cost for 90,000,000 gallons is \$12,775,000 if pumped by steam, and \$9,673,000 if pumped by water-power. At Lardner's Point the cost would be \$7,064,000.

Therefore, to supply the city with 90,000,000 gallons daily of good water, which is the present consumption, the cheapest project is to pump the Delaware water at Lardner's Point; the next is the Neshaminy scheme, and the third is pumping Delaware water at Point Pleasant.

To increase the supply to 150,000,000 gallons requires a total expenditure of about \$12,139,000 if the Perkiomen water only is used, and a total expenditure of about \$17,635,000 if no water is taken from below Green Lane and the deficiency supplied from the eastern affluents of the Lehigh River above the Lehigh Gap.

On the Delaware areas the water stored from the Neshaminy and Tohickon Creeks together could furnish an amount up to 156,000,000 gallons at a cost of \$13,846,662. If, instead of using the Neshaminy water, Delaware water is pumped at Point Pleasant, the cost would be \$14,275,000 if steam, and \$11,215,000 if water-power is employed. To supply Delaware water only would cost, if pumped by steam at Point Pleasant, \$16,355,000, and at Lardner's Point \$10,415,000.

For supplying 150,000,000 gallons daily, therefore, from beyond Lardner's Point, the project contemplating the use both of the Tohickon and Delaware water at Point Pleasant, pumping the latter by water-power, is the least expensive one.

Finally, to increase the supply to 210,000,000 gallons, the Point Pleasant scheme, as already stated, is again the most economical one, besides furnishing decidedly the best quality of water.

It therefore appears with sufficient clearness, I think, that whenever good water can no longer be obtained from Lardner's Point by the pumps which may be considered advisable to place at this point, the city should build an aqueduct to Point Pleasant, pump Delaware water by water-power, and supplement the quantity as it may become necessary by storing the water from the Tohickon Creek, first in the lower and then in the upper reservoir.

After the aqueduct is taxed to its full capacity, at which time it will probably be necessary to go to the Blue Mountains for an increased supply, another aqueduct will have to be built. It is premature, I think, to say definitely at present whether this second aqueduct extending to the Blue Mountains should go by way of the Delaware or Lehigh Rivers. If the South Mountain region should preserve its present character there can be no doubt that it should extend by way of the Perkiomen Valley, and, after receiving the South Mountain water at Green Lane, follow up the

Lehigh River. The cost of this scheme, which now is relatively greater than that of others, would then probably be less. The Point Pleasant aqueduct could later also be carried to the mountains whenever the quality of the water, owing to the pollution from the Lehigh River, becomes objectionable, and its extension would then most economically be to the Delaware Water Gap.

It is better to build two separate aqueducts in this way than only one with double the capacity, because in the latter case the risk from accident becomes greater. New York, Boston, Washington, and Paris have each two; London has even more.

When the above-mentioned aqueducts are built the city of Philadelphia will be supplied with the best water obtainable in eastern Pennsylvania.

Respectfully submitted.



THE CREQUE SYSTEM OF DEFECATING, STORING, CIRCULATING, AND EMPLOYING WATER FOR DOMESTIC PURPOSES.*

AFTER a few preliminary remarks, the speaker exhibited a large sectional diagram of the common "kitchen-range boiler," with which he proceeded to explain and illustrate the serious defects in their construction, form, connecting

* Read by Mr. Allen P. Creque, at a meeting of the Society of Arts, of Boston, May 13, 1886.

devices, and their imperfect mode of circulating the heated water; also, a large number of other diagrams illustrating the construction, form, and connecting appliances of the Creque system of hot-water circulation. The three accompanying illustrations, selected from the exhibit, and explanations, will assist in making the essential features understood. (See Fig. 1.)

The cold-water supply, under pressure, is conveyed in the cold-water supply-pipe D to the compound coupling B, through which it flows into the connecting cold-water supply-tube E, and, pressing against the check-valve F, elevates it from its seat, and discharges through the interstices of the check-valve F laterally into the circulator A some distance above the sediment level, forming a cold-water repository.

Cold water within the "circulator A" enters the inlet of the cold-water circulation-tube H above the level of the check-valve F, and also some distance above the line of sedimentary matter which may be resting upon the bottom end of the circulator, and is conducted through the compound coupling B into the cold-water circulation-pipe J, from whence it enters the water-heater K, where its temperature is greatly increased.

The heated water invariably proceeds from the water-heater K into the hot-water circulation-pipe L, and through the connected hot-water delivery-pipe M to any open hot-water faucet above the circulator A.

If all of the hot-water faucets are closed, the heated water will find its exit from the heater K through the hot-water circulation-pipe L, and be discharged through the coupling C directly into the extreme upper section of the circulator A, where its increasing accumulation will press downward, with a horizontal contact, upon the volume of cold water beneath it, forming a hot-water depository.

When there is an accumulation of hot water in the circulator A, if a faucet on the hot-water delivery-pipe M should be opened, the hot water in the hot-water depository wi

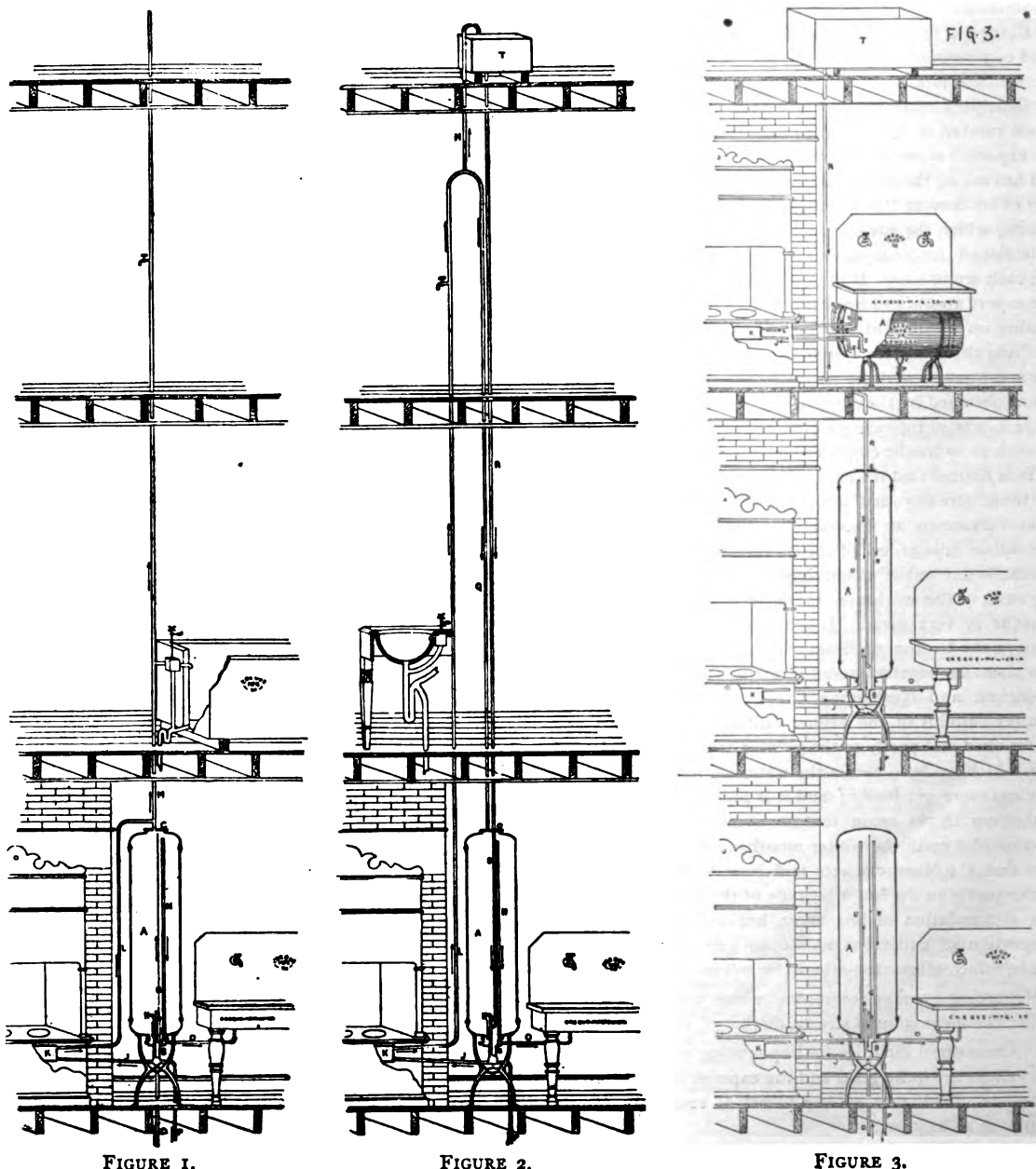


FIGURE 1.

FIGURE 2.

FIGURE 3.

instantly commence to ascend through the coupling C and hot-water delivery-pipe M directly to the discharging faucet.

If a faucet be opened upon the hot-water delivery-pipe O, which is intended to furnish heated water for use upon floors level with, or below, the circulator, heated water from the hot-water depository will immediately descend through the hot-water delivery-tube N, and, passing through the compound coupling B, will be conveyed by the hot-water delivery-pipe O directly to the discharging-faucet.

Should a faucet be opened, simultaneously, upon each of the hot-water delivery-pipes M and O, heated water from the hot-water depository will instantly proceed to both of the discharging-faucets, impelled by an equal division of the pressure contained in the cold-water supply.

Should the cold-water supply be withdrawn in the cold-water supply-tube E, the automatic check-valve F will instantaneously rest upon its seat, formed by the discharge end of the cold-water supply-pipe E, and effectually prevent the return flow of the cold water from the circulator A into the cold-water supply-tube E.

When the automatic check-valve F is closed, any undue pressure created by the expansion of water in the heater K will escape through the relief-valve tube G and the automatic relief-valve contained in the check-valve F into the cold-water supply-tube E.

Sediment is discharged from the circulator A through the compound coupling B and multi-cock into the sediment-pipe P.

Incrustations, compact sand deposits, etc., which cannot be discharged through sediment-pipe P, may be detached, taken out, and the circulator thoroughly cleaned by removing the coupling C and compound coupling B, which will provide two large orifices, or hand-holes, in the the circulator.

Figure 2 represents a hot-water circulator with "return circulation" connections. Cold water from the cold-water supply-tank T flows downward through the cold-water supply-pipe R, and, passing through the multi-coupling C, is conducted by the connecting cold-water supply-tube S to near the bottom of the circulator A, where it is discharged laterally. Cold water within the circulator A enters the inlet orifice of the cold-water circulation-tube H, and is conducted through the compound coupling B and its multi-cock into the cold-water circulation-pipe J, which conveys it into the heater K. The hot water from the heater K is conducted by the hot-water circulation-pipe L to the upper floor of a dwelling where it flows into the return hot-water-pipe Q which conducts it through the multi-coupling C into the extreme upper section of the circulator A. M is a vent-pipe for the escape of steam, air, and expansion. Branch hot-water delivery-pipes are attached to the hot-water circulation-pipe L. Hot water within the circulator A, intended for use upon the same floor occupied by the circulator or floors below it, enters the upper end of the hot-water delivery-tube N, which conveys it through the compound coupling B and connecting hot-water delivery-pipe O to the discharging-faucet.

In Fig. 3 the pipe connections and circulation of the hot-water circulator located upon the first floor is the same as that represented in Fig. 1, with the exception that the top end of the circulator A is solid, and, consequently, there is no hot-water delivery-pipe attached to it. Also, the heated water in heater K is conducted by the hot-water pipe L to the compound coupling B, through which it passes into the hot-water circulation-tube U, and is discharged within the circulator A near its top end. This circulator is especially designed for "apartment houses" where the hot water is required only upon the floor occupied by the circulator.

The hot-water circulator, illustrated upon the second floor (Fig. 3), has the same pipe connections as the circulator upon the first floor of same figure, except that the cold-water supply is furnished from a tank T upon the fourth floor. The cold water is conveyed in the cold-water supply-pipe R to the coupling in the top end of the circulator A through which it flows into the cold-water supply-tube S, and is discharged laterally into the circulator A a short distance above the sediment that may be resting upon the bottom end of the circulator.

The horizontal hot-water circulator, illustrated upon the third floor (Fig. 3), receives its cold-water supply from tank T, located upon the fourth floor. The cold-water supply is conveyed by the cold-water supply-pipe R to the multi-coupling C, secured in the end of the circulator A through which it flows into the cold-water supply-tube S, and is discharged laterally into the circulator above the sediment level. The cold water within the circulator enters the inlet

of the cold-water circulation-tube H above the discharging orifice of the cold-water supply-tube S, and also above the sediment level, and is conducted through the multi-coupling C into the cold-water circulation-pipe J, and thence into the water-heater K. The hot water proceeds from the heater K into the hot-water circulation-pipe L, and is conducted through the multi-coupling C and connected hot-water circulation-tube U and discharged within the circulator near its upper cylindrical side. Hot water for use finds its exit from the circulator through the hot-water delivery-tube N, the multi-coupling C, and connected hot-water delivery-pipe O, to any faucet situated upon either the same floor with the circulator or upon floors above or below it. Sediment resting upon the lower cylindrical side of the circulator is discharged through the coupling V and connecting-pipe P.

The speaker remarked that the name "range boiler" is a misnomer when applied to a vessel known by that appellation. Water is never heated or boiled within it. The water is heated in the water-heater, which generally forms one side of the fire-box of the range or stove, and is sometimes called a stove water-front, or a range water-back. The name hot-water circulator he deemed more appropriate.

Mr. Crique said that these hot-water circulators increased the number of superior materials from which hot-water circulators may be successfully manufactured by providing a large orifice in each end of the circulator, which is indispensable for a proper internal galvanizing, enameling, forming, and baking of circulators made of either galvanized iron, enameled metal, or of porcelain. The method of conveying and discharging the cold-water supply into the circulator establishes an exclusive cold-water repository underneath the hot-water depository, agreeable to the law of gravity. It conveys and discharges the cold-water supply directly into the cold-water repository without passing into or through the hot-water depository. It retains intact the entire volume of water contained in the circulator, circulation-pipes, and heater, which insures an immediate, uniform, and uninterrupted delivery of hot water for use, and prevents sudden and injurious contractions and expansions of the circulator and its various connections, makes reversals of circulation absolutely impossible, and interposes a reliable, effectual bar to the dangers of explosions arising from an exhaustion of the cold-water repository. Should steam attempt to form, the relief-tube and its valve would allow it to quietly and safely escape from the circulator into the cold-water-supply tube whenever the pressure within the circulator and its connections exceeds the maximum hydrostatic pressure of the cold-water supply.

The lateral discharge of the cold-water supply, within the circulator, some distance above its bottom end, promotes the speedy deposit, by gravity, upon the circulator bottom of the coarse vegetable, mineral, and organic substances contained in the feculent cold-water supply. This produces a necessary and very important partial purification in the contents of the cold-water repository. Entering some distance above the sediment level, it also prevents the disturbance or agitation of any sedimentary matter which may be resting upon the bottom end of the circulator. Only the purer cold water is permitted to enter the circulator and flow into the heater, as the inlet of the cold-water-circulation tube is elevated a considerable distance above the sediment level, and also above the discharging orifice of the automatic check-valve, seated upon the outlet end of the cold-water-supply tube. Hence, it is impossible for either the sedimentary matter resting upon the circulator bottom end or the feculent cold-water supply to be absorbed into the circulation and diffused throughout the entire volume of water within the circulator, thus polluting the hot water discharged for use, and inducing the formation of incrustations in all parts of the circulator and its pipe connections. By preventing the circulation-pipes and heater from being coated and clogged with filth, it materially increases the production of heated water, and also its rapid circulation. It also saves much trouble and expense, otherwise necessary, in frequently taking apart the whole apparatus for cleaning.

The temperature of the water being increased in the heater, the heated water will immediately proceed directly to any hot-water faucet, discharging either above or below the level of the circulator without passing into the circulator, or being chilled by contact with, or dispersion into, the cold water volume. An increase in its temperature compels the water to find an exit from the heater, and to advance directly into the extreme upper section of the

circulator, where many of the finer deleterious substances, held in suspension and solution, naturally separate and descend by gravity to the circulator bottom, effecting a second and more thorough purification of the heated water. The heated water is generally retained a considerable time in the circulator, and also circulated many times through the heater before it is discharged for use, which secures the destruction of organic life and an ultimate defecation of the successively heated water, which insures a wholesome, superior quality of hot water suitable for culinary, bathing, and laundry purposes.

It insures an instantaneous discharge, for use, of the hottest water, at any time, contained in either the heater or circulator. It also secures the immediate discharge of the entire volume of heated water when demanded for consumption.

It makes the sediment orifices in the circulator and its connecting-pipe an independent passage which will allow the sediment to be conveniently, separately, safely, and frequently discharged from the circulator without interrupting the circulation and heating of water, or exposing the circulator or heater to the dangers of explosion. The ease and rapidity with which the sediment can be discharged from the circulator serves as an inducement to withdraw it frequently, and thus preserve the water within the circulator in the best possible condition.

An immediate, adequate, and reliable circulation of hot-water service is assured in every instance, whether the bottom end of the circulator be fixed above or below the level of the heater.

The circulator can be placed near or remote from the heater without interfering with a positive, perfect circulation, and a reliable, satisfactory hot-water service.

Its novel compound couplings render practical numerous modifications in the adjustment of the circulation and pipe-connections to circulators of uniform construction, and readily adapts such circulators to all of the particular requirements demanded by each of the many positions that may be selected.

Respecting horizontal hot-water circulators, the speaker said that the horizontal hot-water circulator is peculiarly adapted for service in houses having a restricted floor area, as they utilize the otherwise useless space beneath the kitchen sink. They are adjustable to either side of the range or stove. If preferred, they may be suspended near the ceiling in a kitchen, directly above or on either side of the range or stove. A horizontal circulator placed in either of these five-named positions materially increases the unincumbered available kitchen-floor area, and also secures an immediate, reliable delivery of hot water for use. If suspended near the ceiling in a bath-room, it does not diminish the floor area, and will transfer the excessive heat from the high, undesirable, and injurious temperature of the kitchen, and utilizes the continual radiation of heat from the "circulator" to maintain a mild, agreeable, healthful atmospheric temperature in the bath-room.

A vote of thanks to the speaker brought the meeting to a close.

BOILER CONSTRUCTION.

Iron, in speaking of steam-boiler building and inspection in Manchester, says: Most new boilers are now made of steel, as, although there are some very good qualities of iron in the market, they are dearer than steel, one result of which is that iron of a lower quality is sometimes unwisely resorted to. The difference, however, between even the lower class of iron and steel is not such as to favor the iron, so that steel is now being generally used. But there is steel and steel, and although able to bear a higher tensile strain than iron, yet steel requires careful watching, as it is sometimes very brittle. The Manchester Steam Users' Association, therefore, subjects the plates, of which it proposes boilers should be made, to a series of careful tests. To guard against surprise several strips for testing are prepared. Some of these are pulled asunder in a testing-machine, when the breaking strain per square inch, and the elongation which shows the ductility, are ascertained. The lowest breaking stress admitted is 26 tons per square inch (52,000 lbs.), and the highest 32 tons (64,000 lbs.), the average in practice being 28 tons (56,000 lbs.) The lowest degree of elongation allowed is 20 per cent. on a length of 8 inches, the average amount met with being 25 per cent.; that is to say, in the case of the elongation being 20 per cent., the strip will lengthen an inch and six-tenths in 8 inches, and, in the case of the elongation being 25 per cent., the strip will lengthen 2 inches. As a further test of the ductility

of the plates, several of the strips are submitted to a bending test. They are brought up to a cherry-red heat, then plunged into water at a temperature of about 80°, and when cold are bent double. Should they not bear this test without cracking, the plates from which they were cut are discarded. The association is in favor of having not only the plate-maker's name or trade-mark imprinted clearly on every plate, but also the measure of its tenacity and ductility. Some plates have no brand at all, which is a most objectionable practice. Every maker should be responsible for the quality of the plates he issues. Cases of failure of steel boilers have shown the necessity for the careful tests the association adopts. These tests tend to keep up the quality of the material, and act as a wholesome stimulant to the makers both of steel and iron plates. Local heating of steel plates in working, unless they are subsequently annealed, render them liable to capricious fracture. In fact, the workmanship of the boiler throughout should be carefully examined, and when a boiler has been completed it should be submitted to a searching internal and external examination with the fittings mounted in position. Mounting the fittings in position in preparation for the examination is important. It is not thought sufficient merely to see the fittings in the store, and to be shown a number of blow-out taps, glass water-gauges, safety-valves, and so on, and to be told that one of those was to be used for the boiler, but the identical ones to be adopted are examined, and they have to be fixed in position, so that they can be examined in their places; while for convenience in identification the instructions are that the index number of the boiler should be imprinted on all the fittings. The boiler should also be tested by hydraulic pressure, the fittings included, before leaving the boiler-maker's yard, and certified as satisfactory before it is allowed to be sent to the purchaser. When the boiler is set on the purchaser's premises, it should be again examined, in order to see that the setting is correct, and also that the boiler is properly equipped and properly connected as regards the steam-pipes, the feed-pipes, and the blow-pipes.

Correspondence.

PLAN OF A SANITORIUM.

CITY ENGINEER'S OFFICE,
BOWLING GREEN, KY., November 15, 1886.

SIR: I desire to lay before you and your readers a plan for a Sanitorium which I have under consideration. This is, as you know, the great cave region of Kentucky and the world. The plan is to utilize the cool, perfect, dry and pure air of one of these large caves—say the *Grand Avenue*, situated four miles from the Mammoth Cave, immediately up a railroad just opened—and which contains some nine miles or more of explored avenues, and thousands of cubic yards of air temperature 54° the year round. Construct a building immediately over the cave and connect the cellar with the cave by a shaft or shafts; make the walls and partitions hollow, and admit the cool air into the rooms by registers, thereby enabling one to have any temperature desired in the hottest weather.

I have already consulted many eminent scientific and practical men who think the matter practicable, but their authority on the subject, as the matter has not been tried, so far as I can learn. If this scheme should appear worthy of a place in your widely-circulated paper I should be glad to have the attention of engineers and sanitarians to the matter. I am just in receipt of a letter from Major J. W. Powell, Director of the U. S. Geological Survey, who thinks favorably of the plan. Hoping to hear from you at your earliest convenience, I am, Very truly, M. H. CRUMP, City Engineer and member of the Kentucky Geological Survey.

ON VENTILATION OF DWELLINGS HEATED BY FURNACES.

KANSAS CITY, MO., October 11, 1886.

SIR: I see in your issue of 7th inst. that "Anthony Over" has been annoyed by the changes made in my name by newspaper reporters. Thanks to "Anthony." I did not suppose that any one but myself would notice it.

I wish to say a few words on the subject of heating by furnaces. While I do not doubt that the question of air-circulation is understood by most, if not all, builders of hot-air furnaces, it is a fact that they do not generally put their knowledge in practice, and the result is a very general dissatisfaction on the part of their customers.

Take an ordinary house of eight or ten rooms, basement, and say two floors above it, heater placed in the basement, with cold-air duct from near the ground on one side: every change of wind with a duct so placed changes the inflow of cold air, and it gets all the dust due to its nearness to the ground. This duct should reach above the roof, and as far as possible from any chimney. By this means the inflow of cold air can be made equable and the dust the least amount practicable.

Next, a hot-air duct is led to each room to be warmed. These rooms generally communicate with the hall, and in cold weather have the windows carefully closed. You can't make the average citizen believe in trying to warm out of doors.

Result, the hall-door closed at night and very likely the transom also. How is hot air going to get into the room unless the cold air can get out? If the transom into the hall is open a current of warm air may come into the room and go out there, possibly warming the room some, probably not much; a little air finds its way out at imperfect joints in the windows, and to this extent the air in the sleeping-rooms is renewed. Bad air and lack of warmth is the result, and the furnace is blamed for not being able to fill a room with warm pure air while the cold impure air has no means of escaping.

Such a house has (say) 30,000 cubic feet of air to be warmed and changed by the action of the furnace; contains (say) eight people, requiring, if the air is mixed in the usual way, 20,000 feet or more of fresh air per hour, including a fair allowance for air vitiated by lights or during the night hours, about 12,000 feet per hour. The furnace will use eight or ten pounds of coal per hour, and can use with this about 3,000 cubic feet of air. This is drawn in with the rest from out of doors. It should be drawn wholly from the sleeping-rooms, and as this is drawn from near the floors, it allows the carbonic acid to pass off by gravity without being mixed with the air of the room as it must be by the usual processes.

This is accomplished by a register in the base-board of each room communicating with a separate duct in the bottom of the basement for the supply of the furnace, bearing in mind that cold air descends as certainly as warm air rises, but that the communication must be from bottom to bottom of rooms. By this means the most impure air in the house is constantly carried away by the furnace, and, with the inevitable escape of air from open fire-places and loose windows, will suffice for a very fair ventilation even if no other means is provided.

It is not the intention of this article to take the place of a treatise on ventilation, or to go into details, but simply to call attention to the very general lack of practical information on the subject, and suggest a means which will do away with much of the dissatisfaction now so common with hot-air furnaces.

GALEN W. PEARSONS.

[In houses as usually built the defects of construction compensate to a considerable extent for the want of special arrangements for ventilation.

The supply of air to the furnace fire is usually drawn from the cellar, which in turn derives most of it from ill-fitting cellar doors and windows. The carbonic acid in sleeping-rooms does not collect near the floor, and cannot be disposed of by gravity. The law of the diffusion of gases effectually prevents this. *In houses heated by furnaces every living-room should have an open fire-place.* This will give exit to air sufficient to secure circulation and heating, even when there is no fire in the fire-place.]

OLD CLOTHES AS MANURE.

THE following is from the columns of the *Calcutta Englishman*:

"In Paris old coats, gowns, and other garments are now got rid of in a manner as practical as it is French. They are turned into manure. Upon the principle that nothing must be wasted in this country, they are taken to a large *usine* or boiling establishment, in the outskirts of Paris, and there, by means of a giant machine, worked by eighty horses, are, in the course of about twenty minutes, reduced to a fine brown powder. This is said to prove an excellent manure. Refuse matter of every kind is similarly burnt up."

[As a contribution to the solution of the problem of how to dispose (profitably, if possible) of a frequent source of disease the paragraph is interesting and the proposal ingenious. The existence of a boiling establishment, where, apparently through the medium of a machine worked by eighty horses, the clothes are reduced (by boiling?) to a fine powder, and the statement that general refuse is similarly "burnt" up, seem, however, to indicate the presence of a joke and the victimizing of the journal in whose columns the news appears.—ED.]

WESTERN ASSOCIATION OF ARCHITECTS.

(Continued from page 616.)

THIRD DAY, NOVEMBER 19.

At the last day's session of the convention the following members not before announced were present:

From Chicago—Messrs. J. W. Ackermann, John Addison, F. Alschlager, F. Baumann, E. Baumann, E. Burling, M. L. Beers, A. Blumenthal, F. L. Charnley, W. W. Clay, A. M. F. Colton, Cass Chapman, H. J. Dean, L. B. Dixon, W. H. Drake, J. J. Egan, W. J. Edbrooke, G. H. Edbrooke, J. J. Flanders, F. Foltz, C. S. Frost, C. J. Furst, L. G. Hallberg, C. O. Hansen, J. H. Huber, H. W. Hill, E. S. Jennison, Theodore Karls, William Longhurst, F. T. Leshar, J. H. Moore, O. H. Matz, A. Moody, George M. Moulton, C. C. Miller, John Otter, O. J. Pierce, A. F. Pashley, L. G. Quackenboss, P. W. Ruehl, H. Rehboldt, C. Rudolph, E. C. Rae, C. L. Stiles, F. R. Schock, H. F. Starbuck, William Strippelman, A. Smith, R. E. Schroeder, H. Sierks, J. N. Tilton, F. B. Townsend, C. P. Thomas, T. L. Wheelock, J. A. Weirzbieniec, H. R. Wilson, P. W. Wight, J. R. Willett.

Also Messrs. F. S. Allen, Streeter, Ill.; Thomas B. Annan, St. Louis; George J. Barrett, St. Louis; G. G. Baldwin, Sioux City; J. S. Blake, Des Moines; T. W. Brady, St. Louis; C. A. Curtis, Louisville, Ky.; W. E. Elliott, Elgin, Ill.; G. B. Ferry, Milwaukee; G. M. Goodwin, Minneapolis, Minn.; S. H. Helme, Springfield, Ill.; C. E. Illsley, St. Louis; G. M. P. Knox, Kansas City; C. H. Lee, Des Moines, Iowa; G. W. Orf, Minneapolis; W. G. Robinson, Grand Rapids, Mich.; J. W. Ross, Davenport, Iowa; W. A. Swasey, St. Louis; W. W. Sanborn, Clinton, Iowa; J. K. Taylor, St. Paul; J. S. Taylor, St. Louis; C. A. Wallingford, St. Paul.

The first business of the morning was the passage of the following resolution, offered by Mr. Patton, of Chicago:

That this association adopt the metric system of weights and measures, and appoint a committee of three to correspond with other organizations interested in the subject, with a view to petitioning Congress to pass a law making the metric system compulsory after a reasonable period.

A petition was presented by Architect Henry Lord Gay, against the continuance of an official organ as an injustice to other journals.

E. H. Ketcham, of Indianapolis—I move that this report be laid on the table indefinitely.

Sidney Smith, of Omaha—I move as an amendment that the report be received and discussion be had. [Applause.] Carried, with only one or two votes in the negative.

It being ordered that the discussion be confined to half an hour and two minute speeches, Mr. Smith led off by saying that while he had no personal feeling whatever, he took his stand upon the broad principle of fair play to every one. The best interests of the association formed the question of paramount importance. The association needed the best assistance it could possibly get from the press and did not desire to antagonize the press in any shape or manner. I for one have a particular dislike to being black-guarded in the press [laughter], and I guess all of you feel the same way. Not that I favor any one paper more than another, but I would like to see all publications have the same footing here as the *Inland Architect*. This association at its first session appointed an official organ. Well and good. Now if we could have a more widely extended publicity than we have got, I think it is for the association to deal with that matter entirely. [Applause.]

S. M. Randolph, of Chicago, moved to reconsider the action taken two years ago when an official organ was appointed. Mr. S. Smith seconded the motion, and it was carried. C. E. Illsley, of St. Louis, wondered that so important a matter had not come up earlier, and moved that it be referred to a committee of three, which should report to this convention if there be time or to a subsequent convention. The Chair, answering a question, said that for the time being the association had no official organ. Still an authenticated published report, one verified and found correct by the officers, be considered desirable. Without an official organ, for the association to secure such authenticated report, it would be necessary to buy the short-hand reports already taken, which would cost some \$300. F. G. Corser, of Minneapolis, thought the only dignified course was for the association to publish its own report. An amendment to the motion, providing that the cost of an independent report be reported, was accepted by Mr. Illsley. Mr. Randolph moved to lay Mr. Illsley's motion on the table. Secretary Root thought that a committee's report on the expense was very desirable. Mr. Gay said that the "Technical Associated Press" would furnish its reports to the association free of cost. Mr. Illsley said the *American Architect* began as the official organ of the American Institute of Architects, and the paper was enabled to make headway owing to advertisements that came in as a consequence. Referring to a previous speaker's remark, that only after some months did he receive last year the so-called official report, Mr. Illsley said that had the gentleman subscribed for the official organ he would have received it at once.

Voice—That was just the reason that I didn't subscribe. I didn't wish to be forced into it.

A representative of the publication complained of said that the delay referred to lay with the mails. Aside from this remark, he did not propose to contribute a word to the discussion.

Charles Crapsey, of Cincinnati, corrected Mr. Illsley by saying that the American Institute, of which he was a member, issued its own official proceedings, and these cost the individual members nothing. He wanted a like course here.

An amendment, accepted by Mr. Illsey, instructed the proposed committee to report to this convention.

The motion thus amended was voted down, receiving about half-a-dozen votes.

G. W. Rapp, of Cincinnati, wanted the paper making the lowest bid to publish the proceedings, and send a free copy to every member. Mr. Randolph objected to peddling this thing around. Mr. Gay objected to connecting any man's private interest with this association. Clarence D. Arey, of Cleveland, moved a committee on the probable expense.

E. F. Fassett, of Kansas City—I move as a substitute that the Board of Directors publish the proceedings of this convention in pamphlet form. Adopted, and the convention voted in future to take its own stenographic reports.

After some further remarks, the chair announced as the question pending before the house: "Resolved, That the *Inland Architect* be constituted the official organ of this association."

C. H. Lee, Des Moines, Iowa—I move that the motion be laid on the table.

Mr. Randolph seconded the motion.

It was carried almost unanimously.

E. S. Hammett, of Davenport, Iowa, moved that all names of candidates for membership be submitted to the directors and sent by them to all members thirty days before the meeting of the annual convention. Carried.

The president, vacating the chair to the regulation Viceroy, Sidney Smith, moved that initiation fees be remitted to members of local associations in States where no State organizations exist should they be elected members of the Western Association of Architects.

Mr. Randolph moved a substitute, which was carried, referring the matter to the Board of Directors.

Mr. Illsley, who was down for a paper, decided not to read it owing to the late hour of the convention.

Then followed the reports of two committees on place of meeting and nomination of officers. Chicago and Cincinnati were named, and Cincinnati selected. For President, John W. Root, of Chicago, and Sidney Smith, of Omaha, were nominated. Mr. Smith withdrawing, Mr. Root was declared President, after ballot cast by himself as Secretary, to the great amusement of the convention.

J. F. Alexander, Lafayette, Ind., was elected Secretary, having thirty-nine votes to thirty-five for Mr. Sullivan, and one each for Messrs. Root, Rapp, Ackermann, and Randolph.

For Treasurer, Mr. Rapp withdrew his name in favor of S. A. Treat, of Chicago, who has been an efficient officer.

Mr. Helmers wanted Cincinnati and vicinity to have a majority of the Convention Committee, and hence would decline to become a director. Mr. Yost, of Columbus, O., was suggested; also Mr. Curtin, of Louisville, Ky., and in his favor Mr. Yost begged to retire.

During the balloting divers votes of thanks were put through, the Illinois State Association of Architects being especially remembered; and Messrs. George W. Thompson, of Nashville, Tenn., and W. W. Carlin, of Buffalo, N. Y., were elected members.

Also the President announced the appointment of the following standing committees for the ensuing year:

Discipline—The Board of Directors.

On raising the standard of professional requirements for membership—L. H. Sullivan, Chicago; J. Hodgson, St. Paul; George B. Ferry, Milwaukee.

In charge of the bill governing the office of Supervising Architect of the United States—D. Adler, Chicago; D. H. Burnham, Chicago; J. F. Alexander, Lafayette, Ind.

On collecting statistics on competitions—C. E. Illsley, St. Louis; Sidney Smith, Omaha; E. H. Taylor, Des Moines; G. W. Rapp, Cincinnati; J. F. Alexander, Lafayette.

To represent the Western Association at the next annual convention of the American Institute—W. L. B. Jenney, Chicago; J. F. Alexander, Lafayette; John W. Root, Chicago; Sidney Smith, Omaha; J. S. Haskell, Topeka.

Committee on the Metric System—Normand S. Pelton, Chicago; Thomas B. Annan, St. Louis; S. B. Ferry, Milwaukee, Wis.

President Adler said that his successor would name at a future time the two large and important committees on statutory revision and the formation of State associations, each State represented in the association being entitled to a member on each committee.

The election for Executive Committee resulted in the choice of Messrs. George W. Rapp and Charles Crapsey, of Cincinnati; Dankmar Adler, Chicago; G. M. Goodwin, Minneapolis, and C. A. Curtin, Louisville.

The convention adjourned *sine die*.

NEW JERSEY SANITARY ASSOCIATION.

(Special Correspondence.)

THE twelfth annual meeting of the New Jersey Sanitary Association was held in the State House, at Trenton, on Friday and Saturday of last week. It was the most successful meeting in the history of the association, the papers being of unusual excellence, and the attendance was large and representative.

The first paper presented was on "Trap Ventilation and the Fresh-Air Inlets Thereto," by J. C. Bayles, M. E., of New York. On account of the absence of the author, it was read by George P. Olcott, C. E., of Orange.

The author's observation and experience led him to believe that the simplest form of trap, the S and half-S, adequately vented from the crown, is the best, all things considered.

In conclusion he stated that "the house-drain should not be trapped. A trap of any form there will retard the sewage flow and create worse conditions than those sought to be escaped from." The discussion on this paper was warm and interesting, and was taken part in by Mr. Olcott, Dr. E. M. Hunt, Professor Brackett, Mr. Bassett, and Dr. Newton, and the consensus of the discussion was to the effect that no hard-and-fast rule could obtain applicable to all cases; and second, that all attempts should be made to simplify the plumbing appliances in a house.

A paper was next presented by C. P. Bassett, C. E., Engineer of the East Orange Sewerage Commission, on "The Disposal of House-Sewage in Districts not Provided with Sewers." The author enumerated the various methods employed, such as the pail system, cesspools, dry-earth system, subsoil irrigation, and utilization.

On Friday afternoon, Professor Brackett, of Princeton, delivered a lecture on hydro-dynamics, the movement of fluids in pipes, and collateral topics. The speaker treated the well-known laws in an entertaining manner.

Dr. Henry Mitchell, of Asbury Park, then read an essay on "The Duties of Local Inspectors, How Best Performed, and Details of Methods." This was a presentation from the practical side of the details necessary to the proper management of a local board of health. The necessity for well-trained, competent inspectors was referred to, and the author said that the taxpayers have a right to demand of their servants the proper quantity and quality of work.

At the close of the reading of this paper a resolution was passed to the effect "that a committee be appointed to prepare a plan for the instruction of sanitary inspectors."

The Secretary of the State Board of Health, Dr. Ezra M. Hunt, now addressed the association on "the work of the present and immediate future for boards of health in this State." In the course of his remarks he said that inspectors frequently violate law, or at least undertake to enforce regulations which they have no right to, hence, he would insist that inspectors be properly trained and instructed before being appointed.

Friday evening was devoted to educational interests and the president's address was on the "Physiological Side of Education."

A paper was also presented by Mr. Jacobus, of New Brunswick, on "Physical Restraint in the School-Room." Both of these essays have little interest to readers of THE SANITARY ENGINEER AND CONSTRUCTION RECORD, but it is sufficient to say that the two papers would seem to indicate that the professional educator is rapidly learning that physical culture is as necessary as brain culture.

The session on Saturday morning was opened with a lecture by Mr. J. J. Powers, formerly Inspector of Plumbing to the Brooklyn Board of Health. His topic was "The Work of the Plumber and the Modes of Conveying and Disposing of Sewage."

Mr. Power gave a history of the plumbing trade, and showed what rapid advances had been made, stimulated by the demands of sanitary science.

Following Mr. Powers, a paper on "Preserved Foods" was read by Shippen Wallace, Ph. D., one of the State Chemists. This paper was a study of the canned goods question. The figures presented showed to what enormous proportions the trade had developed. It was mentioned that 72,000,000 cans of tomatoes and 25,000,000 cans of corn were sold during the season. In conclusion he stated that the sensational stories which appear occasionally in the daily papers, and which ascribe a poisonous effect to goods put up in tin, are generally devoid of truth, and that if damaged goods are avoided no danger need be feared, for properly preserved foods are as healthful as the fresh materials.

Dr. D. Benjamin, of Camden, now read a paper on "The Relation between Drinking Water and Typhoid Fever," in which he supported the theory that this disease could not arise spontaneously, but that a prior case must have existed. It was also proven that water was the most frequent carrier of the disease. His thesis was supported by Dr. H. R. Baldwin and Dr. E. M. Hunt.

At the afternoon session Dr. J. H. Raymond, formerly Health Commissioner of Brooklyn, delivered a lecture on "Sanitary Administration," in which he carefully outlined the organization and method of work of a well-ordered health department.

At the conclusion of Dr. Raymond's lecture, Dr. W. K. Newton, of Paterson, lectured on "What Boards of Health can do to Prevent the Sale of Adulterated Foods, etc." It was stated that the laws of New Jersey were ample to grapple with any form of adulteration, and that if local health boards would enforce these laws the public would be protected against all forms of sophistication.

The opinion of the lecturer, however, was that the larger cities were only called upon, or were able to enforce the laws, and that the proper course to pursue would be for the State Board of Health to have charge of the whole matter of enforcement, because local administration could not be depended upon to manage the administration properly.

The annual election of officers resulted in the choice of the following: President, William K. Newton, M. D., of Paterson; First Vice-President, E. L. B. Godfrey, M. D., of Camden; Second Vice-President, Henry Mitchell, M. D., of Asbury Park; Recording Secretary, D. C. English, M. D., of New Brunswick; Corresponding Secretary, J. M. Watson, Esq., of Elizabeth; Treasurer, J. C. Pumpelly, Esq., of Morristown.

The great success of the meeting seemed to be due to the following facts: The papers were practical and presented by practical men, and did not represent theories, but were statements of facts developed by the readers, and founded upon experience. The absence of "cranks" and theorists was noteworthy.

Patents.

352,509. Superheating Gas-Burner. Silas D. Baldwin, Chicago, Ill. Filed May 1, 1886. Issued November 16, 1886.

352,518. Steam-Boiler. George L. Bottum, Cohoes, N. Y., assignor to Margaret A. Bottum, same place. Filed November 23, 1885. Issued November 16, 1886.

352,518. Wrench. Albert A. Coon, Hutsonville, Ill. Filed August 6, 1886. Issued November 16, 1886.

352,530. Pipe-Wrench. James Fatkin, Winifrede, W. Va., assignor to one-half to Thomas O. M. Davis, same place. Filed April 29, 1886. Issued November 16, 1886.

352,531. Drive-Well Point. William F. Felten, Merrill, Wis., assignor to one-half to Armenigle Bernier, same place. Filed May 26, 1886. Issued November 16, 1886.

352,552. Automatic Pipe-Coupling. Robert M. McKinney, Elizabeth, Pa. Filed March 6, 1886. Issued November 16, 1886.

352,578. Cowl. Otto Rotton, Brooklyn, N. Y. Filed June 1, 1886. Issued November 16, 1886.

352,588. Swiveled Spout and Case. Derastus H. Spencer, Jr., Chicago, Ill. Filed August 7, 1886. Issued November 16, 1886.

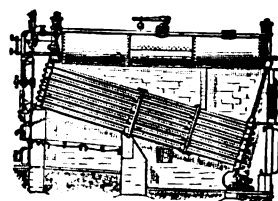
352,597. Chimney-Cap and Ventilator. Frederic W. Wohlfert, New York, N. Y. Filed April 6, 1886. Issued November 16, 1886.

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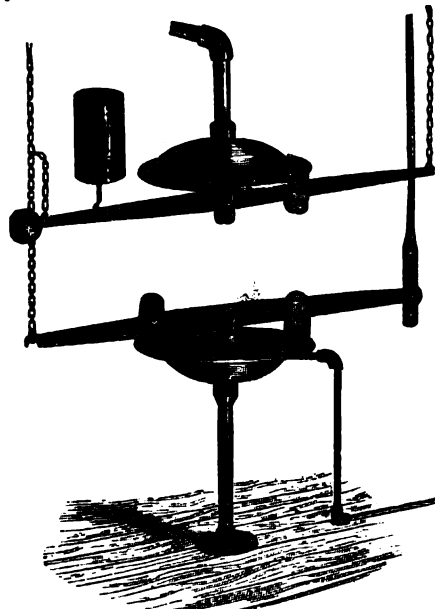
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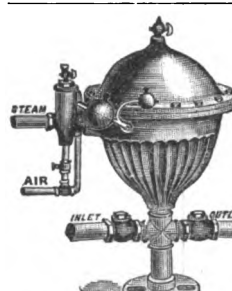
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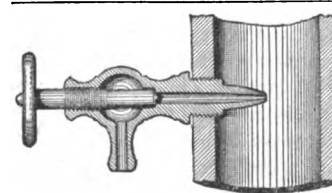
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